1955.

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QUEENSLAND.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE AND STOCK

FOR

THE YEAR 1954-55.

PRESENTED TO PARLIAMENT BY COMMAND.

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ORGANISATION OF THE DEPARTMENT AS AT 30th JUNE, 1955.

SECRETARY FOR AGRICULTURE AND STOCK .. .. Hon. H. H. Collins, M.L.A.

CENTRAL ADMINISTRATION—

Under Secretary .. .. A. F. Bell, M.Sc., D.I.C., A.R.A.C.I.
Assistant Under Secretary (Technical) .. .. R. Veitch, B.Sc.Agr., B.Sc.For.
Assistant Under Secretary .. .. W. T. Gettons, A.I.C.A. (seconded to Queensland Meat Industry Board).
Special Administration Officer .. .. H. Barnes.
Extension Co-ordinator .. .. G. R. Moule, B.V.Sc.
Officer in Charge, Information Services .. .. C. W. Winders, B.Sc.Agr.
Accountant .. .. E. C. Sadler, A.A.U.Q.

DIVISION OF PLANT INDUSTRY—

Director of the Division .. .. W. A. T. Summerville, D.Sc.

Agriculture Branch—

Director of Agriculture .. .. W. J. S. Sloan, M.Sc.Agr.

Regional Experiment Stations—

Director of Regional Experiment Stations .. .. W. G. Wells.

Horticulture Branch—

Director of Horticulture .. .. S. A. Trout, M.Sc., Ph.D.

Science Branch—

Sections of Botany (S. L. Everist, B.Sc.), Entomology (W. A. McDougall, D.Sc.), and Plant Pathology (J. H. Simmonds, M.Sc.).

Chemical Laboratory—

Agricultural Chemist and Biochemist .. .. .. M. White, M.Sc., Ph.D., A.R.A.C.I.

DIVISION OF ANIMAL INDUSTRY—

Director of the Division .. .. W. Webster, B.V.Sc.
Assistant Director .. .. A. L. Clay, B.V.Sc.

Veterinary Services Branch—

Director of Veterinary Services .. .. .. C. R. Mulhearn, B.V.Sc.

Research Branch—

Director of Research .. .. J. Legg, B.Sc., D.V.Sc., M.R.C.V.S.

Sheep and Wool Branch—

Director of Sheep Husbandry .. .. G. R. Moule, B.V.Sc.

Cattle Husbandry Branch—

Director of Cattle Husbandry .. .. Vacant

Pig Branch—

Officer in Charge .. .. F. Bostock.

Poultry Branch—

Officer in Charge .. .. P. Rumball, R.D.A.

DIVISION OF DAIRYING—

Director of Dairying .. .. E. B. Rice, Dip.Ind.Chem.

Field Services Branch—

Director of Field Services .. .. F. B. Coleman.

Research Branch—

Director of Research .. .. L. E. Nichols, B.Sc.Agr., A.R.A.C.I.

DIVISION OF MARKETING—

Director of Marketing .. .. H. S. Hunter.
Assistant Director of Marketing .. .. .. C. H. P. Defries, H.D.A., B.Com., A.F.I.A.

Standards Branch—

Standards Officer .. .. F. B. Coleman

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REPORT OF THE DEPARTMENT OF AGRICULTURE AND STOCK FOR THE YEAR 1954-55.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

Dear Sir,—I have the honour to submit a Report dealing with the activities of this Department for the year ending June 30, 1955, the Report on this occasion being submitted by me as Acting Under Secretary in the absence overseas of the Under Secretary, Mr. Arthur F. Bell. The reports of the Directors of the three production Divisions and of the Director of Marketing will be found in the immediately succeeding pages and these are followed by the detailed reports of the activities of the various Branches.

THE WOOL INDUSTRY.

Overall, the year has been a favourable one for the wool industry despite dry spells in some districts, damage and losses from flooding, the activity of blowflies, and heavy worm infestations.

Pastures generally have been in good condition and both lambings and survivals were high, resulting in an increase of 1,700,000 in the State's sheep numbers during the year ended March 31. Myxomatosis continued among rabbits in the infested areas, thus reducing the depredations of this pest in pastures and encouraging pasture improvement.

Because of the lower average price obtained at the season's wool sales, the offering of 588,207 bales realised approximately £8,208,000 less than the previous season's sales of 572,524 bales worth approximately £63,423,000. A further recession in prices could slow down property improvements which have been a feature of the industry during the period of good realisations. It could also curb the growing interest of graziers in fodder conservation.

The fall in prices has, however, had the effect of causing many graziers to look more closely at their husbandry practices with a view to preventing avoidable losses. Since the war the Department has been accumulating evidence on the value of practices such as the Mules operation and a co-ordinated blowfly control programme. It has also secured much valuable information from trials on problems of fertility, lamb survival, &c. The doubt about future returns that recent sales have engendered in the minds of graziers may prove the spur to more widespread adoption of proved techniques and practices.

Should this situation arise, the Sheep and Wool Branch in particular will find its resources severely taxed if its present staff deficiency cannot be quickly corrected. The Branch during the past year or two has anticipated the situation to some extent by co-operating in the development, within the industry, of a pool of younger graziers not only trained to appreciate and tackle problems on their own properties, but equipped to extend up-to-date information among other graziers. This has been achieved by holding in-residence schools for young woolgrowers in several of the main pastoral regions. Field days have also been held to disseminate new ideas.

There has been some controversy during the year about the usefulness of fleece measurement in the improvement of flocks. The protagonist of the older method of selecting breeding stock points to the progress made by the Merino breed in the hands of experienced studmasters and classers. It cannot be gainsaid that the Australian Merino as it exists today is a remarkable achievement and that it is due in very large measure to the art and skill of studmasters and classers working largely with rule-of-thumb methods.

Statistics suggest that over the past 50 years the average yearly improvement in wool yield in Queensland due to breed improvement has been about one-third of an ounce per head. The question is: Can we do better than that with the assistance of precise information on readily transmissible and economically important characteristics of the breeding stock?

Experience over the past five years has shown that the information which a fleece testing laboratory can provide enables the stud breeder to increase substantially the rate of genetic improvement in his flock. This claim is based not on limited trials but on the results obtained by the numerous studmasters who have applied measurements of fleece yield, clean scoured weights, length of staple, &c. in selecting breeding animals. There is no implication at all that the use of fleece measurements requires the studmaster to dispense with his own techniques, though it may dispel some prejudices. Such measurements are merely another tool, and an accurately forged one, in his hands.

The position with regard to fodder conservation for drought feeding is rather fluid at present, with graziers debating the relative merits of harvesting bush hay and conserving silage crops as means of meeting the problem of food shortages. Experience with bush hay has revealed its limitations as a foodstuff, and it is argued in many places that silage making, even if it is impracticable in some years, is much more attractive in the long run. The Department is assembling information on all aspects of fodder conservation so that the relative merits of various practices may be clearly assessed.

Research projects of the Sheep and Wool Branch have been continued in the field and in the laboratory. Progress has been made in determining factors which influence the lambing performance of ewes and the survival of lambs. Infertility problems of rams have also been further investigated. Drought feeding trials with silage and bush hay have been conducted.

THE MEAT INDUSTRIES.

The Director of the Division of Animal Industry records a measure of uncertainty in the beef industry concerning the type of export carcase at which to aim. It is somewhat unfortunate that this position should arise at the present juncture, when it is important that both producers and the Department know the direction in which they should head. It is hoped that the position will be clarified in the near future and that the requirements of overseas markets for several years ahead will be apparent.

The needs of the expanding domestic market must not be overlooked in preoccupation with the export market. It is obvious that too large a proportion of the meat marketed to-day is below the quality that the discriminating consumer expects. Carcase quality depends largely, of course, on feeding, but breeding also plays a big part, and herd improvement through the use of selected parents offers a convenient, though slow, way of effecting carcase improvement.

In this connection, the Department is sponsoring a herd improvement scheme based on standards of excellence for bulls and cows. Herd owners are being encouraged to grade their breeding stock by these standards and to adopt a breeding programme that will ensure a gradual improvement along desired lines.

The growth rate studies being conducted at various centres with cattle on different feeds continue to yield information on the normal growth pattern and how it may be varied to advantage by supplementary feeding.

Many cattle raisers will recollect the interest in mineral deficiencies in cattle aroused by the visit of Sir Arnold Theiler to Queensland in 1928. The emphasis at that time was on phosphate deficiency—the possibility that trace elements such as copper might also be involved had not been expounded.

It is only in recent years that a sustained effort has been made to determine the extent of mineral deficiencies in the soils and pastures of the cattle areas of the State. A great area of phosphate-deficient country has been mapped, and copper has been found to be subnormal over a large area of near-coastal country.

Investigations were continued during the past year on the correction of phosphate and copper deficiencies of stock. Phosphatic licks have long been advocated and used to supply phosphate, but attention is being given also to the practicability of supplying adequate amounts of phosphate through water charged with an appropriate concentration of the soluble portion of superphosphate. Correction of copper deficiency by injection rather than by drenching is also being actively investigated.

The Department's extension campaign aimed at reducing the incidence of pleuropneumonia has had an effect in limiting the trouble. On a big percentage of affected properties visited by extension officers, inoculation programmes have been or are about to be put into operation. In many cases crushes have been built and other property improvements made to facilitate inoculation. Continued co-operation of meatworks staff and Commonwealth officers stationed at these meatworks in reporting details of infected cattle has been received.

The transport of some 5,000 head of cattle by barge from Cape York Peninsula to Cairns was a noteworthy feature of the year. The movement has not been confined to fat stock ready for slaughter but has included store stock which usually travel overland to fattening properties. It is possible that greater use of sea transport will be made in moving store cattle, particularly when the stock routes are in poor order.

Commonwealth Extension Service Grant funds have been used profitably in demonstration work in the beef cattle industry, particularly in relation to pleuropneumonia control, bush hay production, and correction of mineral deficiencies.

A notable feature of the pig industry during the year was the extremely large reduction in the number of overfat carcases marketed. This is attributable to the adoption of a grading system by processors who had previously not penalised the overfat pig as had the Northern Pig Marketing Board. The industry has every cause to feel gratified at the quick success of its attack on the problem of the overfat pig.

Pig raising investigations on the Regional Experiment Stations were furthered by the establishment of a Berkshire stud at Biloela and a Large White stud at Hermitage. A Tamworth stud was established at the Kairi station some time ago.

DAIRYING.

Though dairy cattle numbers were slightly lower at March 31 than a year earlier, production throughout the year was at a higher level due to the generally favourable pasture conditions.

Because of the high percentage of cheese production that was being exported, a disparity in returns to cheese and butter producers developed and there was some diversion of cheese-milk farm production to buttermaking. This resulted in the closure of five cheese factories during the year.

The industry and the Department are giving attention to expanding domestic cheese consumption by more attractive packaging. The Department is also co-operating with the industry in devising more economical cheesemaking processes.

The quality of both butter and cheese showed an improvement during the year. New regulations under the Dairy Produce Acts have been gazetted with a view to effecting further improvement in dairy farm hygiene, which is basic to improving the quality of dairy products. Considerable emphasis is being placed on dairy hygiene in view of the increasing necessity to raise the standard of butter and cheese on both export and domestic markets. Improved methods of cleaning milking machines and dairy utensils promise to be of material assistance in achieving a higher standard of quality.

Tuberculin testing was extended to further herds and districts during the year and the total number of animals under test in 1954-55 was 915,000. Testing under contract is carried out by 45 private veterinary practitioners as well as by Departmental veterinarians.

Demonstrations of pasture improvement, fodder conservation, milking shed practices, &c., have been conducted in most of the dairying districts under the Commonwealth Dairy Industry Extension Grant. These have attracted much interest among dairy farmers, and many have taken action to improve their own farming along similar lines.

Herd recording of commercial herds continues to expand and new groups are being formed as opportunity allows. The number of herds and animals being tested fluctuates throughout a year but there were approximately 1,250 herds and 48,000 cows under test during 1954-55. Analysis of the data obtained is revealing much information of value to the individual farmer and to the industry.

Laboratory examinations of dairy products were continued in order to check on quality. Quality control and research services were carried on in the Department's dairy laboratories.

EGG PRODUCTION.

The Australian poultry industry has had a worrying year, with low prices offering for eggs on the United Kingdom market. However, the established Queensland grower has faced up to the position and reduced production costs by changing husbandry practices. As a result, the output of eggs has shown only a small decline.

Random sample production trials were successfully initiated in Queensland, 25 hatcheries applying for entry to the first trials, which was limited to eight hatcheries because of restricted space. Useful information on hatchability and rearability has already been obtained; egg production and livability are being assessed.

Replacement of wheat by sorghum in the rations of chickens and layers offers a means of reducing production costs. Experiments and demonstrations conducted during the year yielded evidence of the profitability of substituting sorghum for much of the wheat now being used in rations.

SUGAR.

The State's raw sugar production from the 1954 harvest was about 1,301,000 tons, an increase of 6½ per cent. on the previous year's yield. Some of this has been carried over because the amount exceeded market quotas, and sugar production from the 1955 harvest will be limited to the mill peaks aggregate of 1,170,900 tons. Seasonal conditions will have reduced the sugar content of the cane, so it is expected that a high percentage of the available crop will need to be crushed to reach the figure set.

The overall sugar price of £41 4s. 7d. per ton paid for the 1954 season was £1 3s. 4d. per ton lower than for the 1953 crop. Returns were, however, again well over £50 million.

The working of the Commonwealth Sugar Agreement of 1951 is to be examined in London this year and the price formula reviewed before the fixation of the 1956 price for quota sugar.

Progress is being made in the installation of equipment for bulk handling raw sugar at Mackay and Lucinda. It is expected that the Mackay bulk plant will be ready in 1957 and the Lucinda installation in 1958. A considerable amount of sugar has already been shipped in bulk by bleeding the bags into the ship's hold.

Proposals have been made for the installation of port terminal plants for mechanical bulk handling at Cairns, Mourilyan Harbour, and Townsville.

The sugar industry has the responsibility of financing bulk installations at loading ports. However, receival facilities must be provided at unloading ports. The Colonial Sugar Refining Company is receiving bulk sugar at both Sydney and Melbourne, and some facilities are also available in the United Kingdom.

GRAIN CROPS.

Despite late planting of about one-third of the wheat acreage and a very wet harvest period, the 700,000 acres sown yielded over 15 million bushels, which, in the circumstances can be regarded as being very satisfactory.

A feature of the season's crop was the area devoted to one of the Department's more recent releases—Spica—which occupied 17·5 per cent. of the acreage sown. Its resistance to shattering proved of great value during the wet conditions which prevailed at the end of the season.

Great interest is being shown in improving the protein content of wheat grown in Queensland in order to ensure a firm footing on export markets demanding high quality grain. The Department has this feature to the fore in its wheat breeding programme. Certain cultural investigations are also aimed at raising the protein content. The Department's cereal laboratory has had a busy year working on quality and made examinations of grain from crops entered in the wheat competition organised by the Royal Agricultural Society of Queensland.

Bulk harvesting of wheat was extended on farms and the Wheat Board opened additional bulk storages on the Darling Downs. The extent to which complete handling in bulk can be adopted is limited at the moment by the availability of railway wagons suitable for loose grain.

Plantings of barley, which jumped from 28,000 acres in 1951 to 72,000 acres in 1952, have remained at a high level. Some 65,000 acres, yielding 1,700,000 bushels, were planted in 1954. The amount available for export from this crop was over a million bushels. The Barley Marketing Board adopted a classification system and was able to export malting quality barley instead of the mixture of grades which was marketed overseas from previous crops. It is estimated that 90,000 acres were planted to barley in the current year.

For the five seasons immediately prior to 1954-55, maize plantings varied little from a mean of about 111,000 acres.

The annual yield ranged approximately from 2½ millon to 3 million bushels. The 1955 harvest from 103,000 acres yielded about 2¼ million bushels, the lowest figure for some time. Prolonged wet conditions in most districts were responsible for the low yield of less than 22 bushels per acre. Over 8,000 bushels of certified hybrid maize seed were available for the 1954 planting. The Department is endeavouring to encourage the still more extensive use of hybrid maize in view of its undoubted advantages in many districts.

Grain sorghum production of 3 million bushels in 1954-55 was the lowest since the 1951 harvest, largely because of a much lower acreage than average being planted owing to dry conditions during the normal planting period. Certified grain sorghum seed production in 1954 amounted to nearly 15,000 bushels and some of this was carried over. Growers initiated a move for the setting up of a compulsory marketing board for grain sorghum, and this matter is still in train.

The 20,000 acres planted to linseed in 1954 was a very much higher acreage than that of the previous year. The yield of 200,000 bushels was satisfactory but did not reach that of the 1952 harvest. However, with the prospect of a better financial return, an estimated 35,000 acres has been sown this year.

TOBACCO.

The year has been an eventful one for the Queensland tobacco industry.

Though the whole of the 1954-55 crop of leaf had not been disposed of by June 30, it is obvious that the return from sales will be the highest ever recorded. The North Queensland crop may return £1¾ million, while offerings from South Queensland growers may realise about £1¼ million.

The good yields and high average price obtained should stimulate increased plantings above the 4,550 acres planted last season.

The year saw considerable progress towards agreement on plans for the establishment and management of a Tobacco Trust Fund. The proposals are that the Commonwealth Government, tobacco manufacturers, and tobacco growers subscribe to a trust fund which will be utilised to finance research and extension programmes of various organisations.

The Department's new tobacco experiment station at Inglewood is to be officially opened soon. Development of the new Parada station near Dimbulah is proceeding and plans are being made to conduct tobacco investigations in a special section of the Experiment Station at Millaroo on the Burdekin.

The tobacco industry appears to be entering into a period of expansion, which will be accelerated as additional areas are brought under irrigation. The Department hopes to keep its research and extension services abreast of this expansion. To this end a Senior Agronomist has been appointed to take charge of a special tobacco team in the Department.

COTTON.

The prospect for the 1955 cotton harvest is a disappointing one for all concerned. It is estimated that 20,000 acres were planted—over twice the area harvested in 1954—and a yield of 7,000-8,000 bales of raw cotton would have been obtained in a satisfactory season. Extremely wet conditions, however, played havoc with the crop and it is estimated that only 4,000 bales of raw cotton will be harvested. Nevertheless, established and prospective cotton growers are already showing considerable interest in the new season's planting.

The Cotton Marketing Board is considering the installation of new plant at its ginneries at Whinstanes and Glenmore.

The guarantee of an average price of at least 9½d. per lb. seed cotton has been extended by the Commonwealth Government to the end of 1958. During the past two seasons the actual price guaranteed by regulation was 14d., and this has been extended to cover the 1955-56 crop.

HORTICULTURE.

The element of uncertainty in the fruit and vegetable industries was well in evidence during the past year. Excessively wet weather and cyclones destroyed or reduced many plantings, while prices were not uniformly satisfactory.

Doubt about the future of fruit growing in the far north was felt when the fruit cannery at Cairns experienced financial trouble, but eventually a scheme was adopted whereby the Committee of Direction of Fruit Marketing will operate this cannery. The assurance of a continued outlet for pineapples and some other products through the cannery will no doubt strengthen the industry in the north. Firm action taken by the Banana Industry Protection Board to suppress an outbreak of bunchy top of bananas in the Innisfail district has probably saved northern banana growers from heavy losses.

Research and extension work was continued by the Department in the various horticultural industries. Many of the field investigations now in progress—for example, foliage fertilizer sprays, chemical weed control, pineapple black heart control, stock-scion relationships—are long-term projects and progress only can be reported at this stage.

Storage, processing, packaging and other aspects of marketing and distribution of fruits and vegetables are being actively investigated.

Waxing treatment of bananas to extend their marketable life, as devised by the Department, has become a commercial practice. Good results have been obtained in apple storage experiments but confirmation thereof is required before the practices concerned can be recommended. Storage investigations have now been extended to plums and peaches. Avocado spreads have been formulated in an endeavour to extend the market for this fruit.

Packaging of a number of fruits and vegetables in plastic bags has been tested under various conditions and it has been shown that certain lines may be held in such packages in

cool storage for several weeks without noticeable deterioration. This work opens up the possibility of supplying perishable fruits and vegetables in good condition to distant parts of the State as well as to other States and countries.

REVIEW OF A DECADE.

During the years in which the Department of Agriculture and Stock has operated as an independent Department, great changes in the extent and diversity of agriculture in the State have occurred. There have been similar major changes in agricultural and related practices right through from land development to marketing and processing of farm products. Throughout this period, too, agricultural science has made marked progress.

The changing conditions of agriculture have dictated changes in Departmental organisation from time to time. The last major re-organisation was effected in 1945, following a searching investigation of the activities of the Department and of the organisation and control of its staff, carried out by the late Mr. J. Irwin, Deputy Public Service Commissioner, and Mr. Arthur F. Bell, now Under Secretary of this Department. For the purpose of this investigation they were appointed Public Service Commissioner's Inspectors.

At the end of the first decade of operations on the new basis—a decade which almost wholly coincides with the tenure of office of the present Secretary for Agriculture and Stock—it is appropriate to review some of the major achievements of the Department, particularly in those fields in which the Public Service Commissioner's Inspectors recommended specific innovations. It is of interest also to examine to what extent the Commissioner's expectation that "the Department of Agriculture and Stock will be able to render outstanding service to all classes of primary producers and to assist in the solution of problems affecting agricultural and pastoral production" has been realised.

One of the proposals to which effect was given was that the Department be organised into five Divisions—Administration, Plant Industry, Animal Industry, Dairying, and Marketing. For the most part this division of responsibilities has functioned up to expectations. It did not imply any rigid separation of activities and staff into watertight compartments, and in practice there is no such sharp delineation. In all spheres there is evident a desire by those concerned to co-operate and collaborate to ensure effective planning and prosecution of the work in hand. One need only quote the joint approach to dairy farm demonstrations by the Divisions of Plant Industry, Animal Industry and Dairying; the certification of seeds, in which Plant Industry and Marketing are concerned; and the operations of Plant Industry and Animal Industry on the Regional Experiment Stations.

Experiment Stations.

The 1943-44 investigators recommended that in plant industry "as far as possible research and experiment work should be conducted at regional stations under the control of responsible officers."

Early action was taken to establish a chain of regional experiment stations under unified direction. The Callide Cotton Research Station at Biloela was converted to a regional station in 1945; and new regional stations were opened at Hermitage on the southern Darling Downs and at Kairi on the Atherton Tableland in 1946, followed by Ayr on the Burdekin Delta in 1948.

The objective of these stations is to study the farming problems of specific regions and to attempt to find solutions to them in both crop and livestock production. The general management of the stations is vested in the Regional Experiment Stations Branch of the Division of Plant Industry. This Branch plans and conducts certain research in plant industry and provides facilities for research by other Branches of the Department.

Appropriate livestock facilities have been or are being provided on all regional stations so that agricultural practices involving livestock—and conversely, animal husbandry practices based on crop and pasture—may be studied. The integration of crop husbandry and stock husbandry is considered to be the key to the advancement of primary production in many sections of the State. The regional experiment stations must accordingly be geared to a joint study of crops and stock.

There is a commercial Jersey dairy herd at Kairi and pigs and poultry are also handled there. At the Ayr station, beef cattle are run on experimental pastures. An A.I.S. dairy herd has been set up at Biloela, as well as a pig stud. A start with livestock has been made at Hermitage with the setting up of a piggery, and the acquisition of a small flock of wethers.

The agronomic investigations conducted by the Regional Experiment Stations Branch vary in nature according to the region concerned. At Hermitage, emphasis is placed on long-term crop rotations with and without a grazing phase; considerable attention is also given to agronomic trials on the major grain crops of the Downs.

Much of the work at Biloela apart from cotton growing investigations is concerned with the provision of grazing for dairy cattle in the Callide Valley and adjacent areas.

At Ayr the two main phases are exploratory work on the husbandry of crops other than sugar cane and the formulation and testing of irrigation pasture mixtures for cattle grazing.

The Kairi station devotes most of its attention on the agronomic side of maize and dairy pastures.

There are, of course, definite limitations to the extent to which regional stations with a comprehensive charter can meet the needs of any primary industry. Some crops, for instance, are growing in restricted areas that cannot be paralleled on a station that must cater for a variety of crop and livestock industries. Such conditions exist in the horticultural and tobacco growing industries. Similarly, the wool growing industry of the north-west has little or no community of interest with any other primary industry.

To meet the special needs that cannot be served by regional experiment stations, specialised stations have been established. A horticultural station concerned mainly with sub-tropical fruits was opened in the Maroochy district in 1946. The former tropical nursery at Kamerunga near Cairns was reopened on a wider basis in the same year. Another horticultural station concentrating on vegetables and some fruit crops was established in the Redlands district in 1947.

Tobacco experimental areas have been operated in the Mareeba and Burdekin areas for some years. The needs of the tobacco industry, however, have recently called for more intensive investigational work and the Department has accordingly put two new tobacco experiment stations in train—one at Parada, between Mareeba and Dimbulah, and one at Inglewood.

A field station was opened in 1952 at Coolum, in the Wallum country of the near North Coast, to explore the possibilities of developing this type of land for agricultural purposes.

With the aid of Commonwealth Wool Funds, a sheep field station was established near Julia Creek in 1951 for the purpose of investigating problems of sheep breeding and feeding in the north-west.

On the animal husbandry side also, the Department recently opened an animal husbandry research farm at Rocklea as a subsidiary of the long-established Animal Research Institute. Work is proceeding on the new property on a variety of problems in cattle and poultry husbandry.

The Department also has a major interest in "Brian Pastures" Research Station in the Central Burnett. Though owned by the Australian Meat Board and supervised by a joint committee of the Board, C.S.I.R.O. and the Department of Agriculture and Stock, the station is staffed and operated by this Department.

This brief resume of the development of new experiment stations during the past decade indicates that considerable progress has been made towards the goal of providing adequate field research services for the various land industries. The Department is now operating or developing sixteen stations, compared with only five at the beginning of 1945.

To what extent these stations will be able to meet in full the growing demands on agricultural and veterinary science remains to be seen. Such stations are costly to establish and maintain and they are difficult to staff adequately in these days of acute competition for trained men. However, it may be necessary, as opportunity offers, to add to their numbers in order to meet the requirements of a developing State in which the end of expansion of primary production is still far in the future.

Cattle and Sheep.

In the re-organisation proposed in 1944, the responsibility for the health and husbandry of all classes of livestock, including dairy cattle, was to be placed on a Division of Animal Industry. On the cattle husbandry side, this involved the formation of an entirely new branch to take over husbandry functions performed previously by the Stock Branch, the Dairy Branch, and the Agricultural Chemist.

The Cattle Husbandry Branch was established in 1948 with a small staff of trained officers and in the intervening years has been built up to a strength of 29 technical officers stationed in 18 centres throughout the State.

The services rendered by this Branch to the beef cattle industry are far beyond those provided by the Department before its formation. Departmental interest in the industry pre-war was largely directed to the investigation and control of pest and disease problems. No planned effort was made to provide research or extension services on purely husbandry matters. At the present time such diverse subjects as correction of mineral deficiencies, the determination of growth patterns, crop fattening, and breeding programmes are all receiving a considerable amount of attention from Branch officers, and advice is readily available to all cattle raisers on many aspects of husbandry.

It is very gratifying that the Department is now pulling its weight so far as beef cattle husbandry is concerned. The industry is one of our most important and in it there is much room for improvement in husbandry practices.

The dairying industry likewise has benefited from the special attention given to its husbandry problems as distinct from those of quality of the raw and processed products. The adequate feeding of dairy cattle is fundamental to efficient production and the Cattle Husbandry Branch has been particularly active in this field.

The Sheep and Wool Branch has also made a noteworthy contribution to its particular industry since the re-organisation of the Department. Prior to 1945, the Sheep Branch consisted of two advisers, an establishment which obviously was quite inadequate to service an industry of the magnitude of the sheep industry.

Following the re-organisation, the staff was quickly built up to provide services more commensurate with the importance of the industry. Advisers were recruited largely from within the industry and stationed in the main sheep centres. Husbandry officers were also appointed to conduct research on industry problems. As mentioned elsewhere, a field station was set up to provide research facilities, and a wool biology laboratory was also established.

The energetic approach of the Branch to long-standing problems of the industry, such as blowfly attack and worm infestation, resulted in considerable alleviation of various troubles and quickly led to recognition of the usefulness of the Branch among woolgrowers. The value of its services is now appreciated throughout the whole of the sheep raising areas, in marked contrast to the handful of woolgrowers who benefited in the earlier years.

Laboratory Expansion.

The expansion of research and extension work inherent in the reorganisation had to be accompanied by a corresponding increase in laboratory facilities. Such facilities are not readily provided, inasmuch as appropriate quarters have to be built, equipment has to be assembled, and staff has to be recruited and trained. All of these have encountered very real difficulties in the post-war years. Though all the facilities envisaged have not yet been provided, considerable progress has been made, as will be evident from the following brief review.

The leadership of the late J. C. Brunnich established a good reputation for the Department's agricultural chemical laboratory throughout Australia and overseas. During the post-war period this reputation has been considerably enhanced by the scientific work of a capable team of chemists most ably led by Dr. Montgomery White.* Its sections of plant nutrition, biochemistry, toxicology and therapeutics and general analysis—working with specialists in other fields—have made important contributions to both pure and applied science. One might mention as examples the study of fluorosis in sheep and investigations of trace element deficiencies in plants and animals.

Two units of the Chemical Laboratory that have been developed in more recent years are those concerned with soil surveys and cereal chemistry. Regional laboratories have been set up at Ayr and Atherton to serve soil survey teams operating on irrigation projects. The cereal chemistry laboratory has been established to study problems of grain quality.

The Division of Animal Industry's research laboratory at the Animal Research Institute at Yeerongpilly now embraces a much wider field of operations than in pre-war days and its staff has been considerably enlarged to deal with the additional work. General animal husbandry now comes within the ambit of the laboratory's operations, as well as veterinary pathology and veterinary parasitology, to which attention has long been devoted. A subsidiary of this laboratory provides a range of services to livestock owners in North Queensland.

In accordance with its charter to take such action "as will ensure the preservation of high quality products, detect defects in products of lower quality, ascertain the causes and where possible apply remedies," the Division of Dairying has extended its bacteriological and chemical laboratory services.

In addition to expanding the old-established laboratories in Brisbane and Toowoomba, the Division has established regional research laboratories at Murgon and Malanda. This spread of laboratories has enabled the Department to provide good technical services to producers, processors, and consumers of dairy products.

In order to assist genetic improvement of breeding stock in the sheep industry, the Department in 1951 established a wool biology laboratory in Brisbane. The main purpose of the laboratory is to examine wool quality and to advise studmasters and flockmasters on breeding programmes that could be expected to improve quality and yield. Numerous studs and flocks are now participating in this fleece-testing service, which promises considerable benefit to woolgrowers.

The re-organisation of 1945 provided for the formation of a food technology laboratory within the Horticulture Branch to deal with problems of transport, preservation, and processing of fruit and vegetables. This laboratory has operated most successfully in all these fields and it is hoped to provide new quarters and equipment that will further enhance its usefulness.

Laboratory services in seed testing, plant pathology and entomology have been provided on a larger scale in recent years. Plant pathology field stations have been opened at Nambour, Stanthorpe, Kingaroy, and Cairns to supplement earlier established laboratories at Brisbane and Toowoomba. Entomology field stations are operating at Nambour, Toowoomba, Stanthorpe, Yarraman, Rockhampton, Ayr, and South Johnstone. Entomology headquarters, of course, are in Brisbane where a fine set of glasshouses for plant pathological investigations has also been provided.

Veterinary Services.

The health of our livestock is of very great importance to the State's economy. While a good deal of Departmental effort is directed towards protective measures such as adequate feeding and sanitation on farms and stations, heavy demands are made on veterinary services in the fields of disease control and treatment.

In retrospect, the veterinary services of the State prior to the 'thirties appear pathetically weak numerically when considered in relation to the livestock population and the pest and disease position. A few trained veterinarians came into the Department in the 'thirties to supplement the existing small staff, but it was not until the Departmental re-organisation became effective that the objective of a well staffed and well organised Veterinary Services Branch came into sight.

The full establishment of this Branch includes a strong decentralised team of qualified veterinarians serving the needs of the several livestock industries and supervising the work of stock inspectors whose duty is mainly preventing the spread of stock pests and diseases.

Obviously, the Department cannot employ sufficient veterinarians to treat the multitude of individual cases of illness and injury among stock. Its officers must be reserved for work in wider fields. The answer to the demand for individual attention has been met to a large extent in the dairying and adjacent districts by contract inducements accepted by private practitioners under the Department's tuberculosis eradication scheme in dairy herds.

This scheme stemmed from tuberculin testing conducted by United States Army veterinarians on farms supplying the United States Forces with milk during the Second World War. The Queensland Government followed this lead and

* It is with deep regret that the death of Dr. White, since this report was prepared, has to be recorded.

in 1945 instituted a tuberculosis eradication scheme in dairy herds. In the first year of testing, which was then mainly confined to herds supplying milk to Brisbane, 19,419 cattle were tested.

Expansion of the scheme to most of the important dairying areas in the intervening years has brought the number of dairy cattle embraced in it to 915,000. The results of the scheme to date show that by systematic testing and elimination of reactors the incidence of the disease can be reduced to very small proportions with eradication as the ultimate objective. In some districts, the incidence is as low as ·08 per cent.

Pasture Improvement.

Perhaps one of the most spectacular features of the past decade has been the tremendous interest in pastures and the application of pasture improvement methods. It is true that there were bursts of enthusiasm for pasture improvement in the decade before the war, but interest was not sustained as it has been in recent years.

There are several reasons for the increased and sustained tempo of pasture improvement. New facts have emerged from research; species that were new introductions in the 'thirties have proved their usefulness; seasons generally have been favourable; stock-owners have been in a better financial position; suitable machinery for pasture improvement is now more readily available; irrigation is more widely practised; and demonstration of the practicability of improving pastures is more widespread and effective.

The Department's activities in relation to pasture improvement have contributed in no small measure to the present satisfactory position. Research has been actively prosecuted at a number of centres. It has embraced such aspects as species, variety and strain trials, topdressing, irrigation, row planting and cultivation, management practices, and legume inoculation. The last-mentioned is a development of considerable significance, inasmuch as the sorting out of effective strains of nitrogen-fixing bacteria for various pasture legumes has provided a much better chance of establishing clovers, which are key species in many types of improved pasture.

The Department has been particularly active in demonstrating that pasture improvement is both possible and profitable under a wide range of conditions. Such demonstration is much more effective than any other method of inducing farmers and graziers to undertake pasture improvement. All the dairying districts and some of the pastoral districts have been served with demonstration areas, assistance for which has in many cases been forthcoming from Commonwealth Government and dairying industry funds.

All in all, a very considerable proportion of their time is now being devoted to pastures by Departmental officers. A team of specialists is supported by numerous field officers of the Agriculture Branch, the Field Services Branch of the Division of Dairying, the Cattle Husbandry Branch, and the Regional Experiment Stations Branch. The results of their combined labours are evident in the snowballing pasture improvement movement throughout the State.

Marketing Services.

One of the recommendations of the Public Service Commissioner's Inspectors was "that the departmental activities in connection with the marketing of primary products should be extended to include market reports and current crop statistics."

This recommendation arose from two facts, the first being that reliable information on market prices and crop prospects was not readily available to producers, distributors, and others to whom it would be of considerable use; and the second that crop reporting and market price reporting had proved of great value in the United States.

The new Division of Marketing immediately took preliminary steps to launch such services and it was not long before both began to operate. The scope of each has been widened since as opportunity permitted.

Crop reporting now covers wheat, maize, grain sorghum, barley, potatoes, peanuts, tobacco, and poultry products. Detailed reports on each of these commodities are issued at intervals during the year. In addition statistical information is presented for a wider range of commodities in a monthly production trends report which has a regular distribution of 700 copies.

Both daily and weekly market price reports for fruit, vegetables, and miscellaneous commodities are issued. The daily reports are supplied to 200 regular recipients.

The demand for crop and price reports is an indication that the services are appreciated. Their usefulness extends far beyond the farming community. The crop reports, for instance, are valuable to distributors of agricultural chemicals and fuels, to machinery merchants, to transport organisations, to processors, and so on. Market price reports are useful to country buyers, to contract purchasers for institutions, etc.

Though market price reporting has run smoothly in the hands of skilled reporters, constant close attention to various phases of crop reporting has been necessary to ensure a reasonable degree of reliability. An ever-changing team of honorary crop correspondents is not the most accurate source of data for crop forecasting. However, these correspondents undoubtedly have contributed very largely to the success of the crop reporting project and are worthy of commendation for the time and thought they have given to it.

Herd Recording.

It has long been recognised that herd recording may serve two very useful purposes, firstly to reveal the productive ability of the individual cows and secondly to demonstrate to farmers any shortcomings which there may be in their husbandry methods.

A herd recording scheme for commercial herds that was operated by the Department before the Second World War was virtually abandoned during that war. A revised scheme was begun following the drought of 1945-46, with the Commonwealth Government, the State Government, and participating farmers sharing the cost.

In pre-war years, milk testing was carried out on samples taken by the farmer and despatched to a central testing laboratory. Under the present scheme a district herd recorder visits each farm at regular intervals, takes the samples himself and provides the farmer with a monthly statement of the results of the tests. This change brought the Queensland scheme into line with those operating efficiently in other States and countries.

This scheme has proved very popular with dairy farmers and now covers approximately 48,000 cows in 1,250 herds, compared with 17,216 cows in 507 herds in the first full year of the scheme.

The Decade's Balance Sheet.

The brief review, in the preceding paragraphs, of the progress made since the initiation of the re-organisation scheme shows that the Department has gone a long way towards implementing, in full, the recommendations of the Inspectors appointed by the Public Service Commissioner. This is particularly gratifying in view of the many difficulties encountered in implementing them in a period in which there has been acute competition for both the necessary trained men and materials.

SEED CERTIFICATION.

This Department has long been in the forefront in setting standards for various farm requirements and in scrutinizing the sale of such requirements to ensure that their quality is maintained. Among the services provided in this connection is that of seed examination to safeguard farmers against seed of poor germinability or seed containing deleterious or useless matter.

The usual report on the results of the examination relates only to those aspects of suitability of seed; it gives no information regarding the conditions under which the seed was produced, the yield capacity of the crop that produced it, nor the type of plant that might be expected from the seed.

Obviously, seed carrying a certificate relating to these important desiderata could be of considerable value not only in improving yields but also in providing the advantages arising from uniformity in a crop.

Prior to the Second World War the Department shared the growing world-wide interest in certification of seeds for trueness to type, strain or variety. "*The Seeds Act of* 1937" was amended in 1941 to provide for the formation of a seed certification committee to control the certification of seeds, but it was not until 1945 that a favourable opportunity to embark on seed certification in Queensland presented itself. Sub-committees dealing with hybrid maize, beans, and sorghums were set up in the same year, and regulations covering the production of hybrid maize seed were gazetted on 4th October, 1945. By that time, the hybrid maize breeding programme of the Queensland Agricultural High School and College had reached the stage where commercial seed production was neecssary to meet the demand and Departmental assistance was sought in launching a seed production scheme.

The first seed to be certified was that of grain sorghum, 600 bushels being produced in the 1947-48 season. The commercial production of hybrid maize required a little longer time to organise owing to the special requirements of producing this seed. In 1948-49, 306½ bushels of hybrid maize seed and 523 bushels of grain sorghum were certified. In the same year, the first certification of 100 lb. of French bean and 218¾ oz. of tomato seeds was made. Crops eligible for certification in 1948-49 were 8 varieties of hybrid maize, 5 varieties of grain sorghum, Sugardrip sweet sorghum, Roma Sudan grass, Brown Beauty beans, 4 varieties of tomatoes and 2 varieties of papaw, so it is evident that the officers responsible for crop improvement had recognised the desirability of extending certification as rapidly as possible.

The many hazards of certified seed production, particularly those of the initial stages, delayed certification of some of these crops, and papaw seed, in fact, has not yet been certified. Roma Sudan grass was certified first in 1949-50; sweet sorghum in 1950-51; cowpeas in 1952-53.

The difficulties and perplexities of certified seed production are very real ones. It is often difficult, for instance, to ensure the requisite isolation of cross-pollinated crops. Outbreaks of disease, particularly in beans and tomatoes, may cause rejection of seed intended for certification. On occasions, mature crops have to be abandoned so far as certification is concerned owing to harvest troubles such as lodging and incipient germination. The human factor in certified seed production is a strong one; growers must meet rigid requirements in relation to rogueing, weed control, pest control, seed cleaning, and even, with hybrid maize, detasselling plants daily at a certain stage. During the few years in which certification has been operating in Queensland, many crops have been rejected because of neglect to rogue or perform some other essential operation.

At this stage it is pertinent to ask: Has seed certification justified itself as a means of crop improvement?

It must be admitted that in the case of papaws and beans little or no very tangible results have as yet been shown in commercial production. Papaw seed certification has not yet proceeded beyond the stage of selecting suitable mother seed. The disease position in French beans is such that the industry cannot rely on stocks of certified seed being available every year. Certification of beans at the moment is

restricted to the certification of mother seed from which seed true to type, even if not free from disease, may be grown for commercial planting.

In the grain crops, however, a considerable degree of success may be claimed. Up to 8,000 bushels of hybrid maize seed has been certified in a single year—sufficient to plant a high proportion of the current acreage in every district for which suitable hybrids are available. Certified seed production has now outstripped the demand and efforts are being made to stimulate the greater use of this seed. Because of the extra expense involved in growing certified seed, it cannot be sold as cheaply as seed of open pollinated varieties, but it is reasonable to assume that as maize growers generally come to appreciate the higher yielding capacity of recommended hybrids, the extra charge for seed will not prove a deterrent.

Until last year, certified seed of grain sorghum varieties was insufficient to meet the demand. However, a large increase in the 1953-54 plantings for certification resulted in nearly 15,000 bushels being harvested, and a small carry-over occurred. One of the great advantages of using certified grain sorghum seed is a higher degree of uniformity of heading height, which facilitates harvesting. This feature alone should encourage heavier plantings of certified seed as it becomes better known.

Tomato seed certification has run fairly smoothly since its inception and is meeting the demands of tomato growers in districts for which the certified varieties are suitable.

Though certified sweet sorghum, Sudan grass and cowpea seeds are not yet being produced in large quantities, the schemes are all soundly based and are expected to make a substantial contribution to the industries as they come to fruition.

WEED CONTROL.

The unwanted plant life of Queensland embraces a great variety of plant types, ranging from forest trees to minute forms of life. The eradication or control of undesirable plants consequently involves the adoption of many different techniques, mechanical, chemical, agronomic, and regulatory.

The responsibility for weed control in Queensland is divided among several authorities. The Department of Agriculture and Stock exercises no regulatory powers with respect to weed control—these are vested in the Department of Public Lands, the Local Government Department, and city, town, and shire councils. Neither the declaration of plants as noxious nor regulatory action to enforce destruction of such plants comes within the ambit of the Department of Agriculture and Stock. The Standards Act administered by the Department does, however, provide for certain action with respect to the distribution of weeds in seeds, fodders, &c.

The Department's direct concern in weed control is with identification, advice, and experimentation. It is also represented on the Weeds Sub-committee of the Stock Routes Co-ordinating Board, which advises the Minister for Public Lands on weed control matters coming within his province and implements eradication measures.

Identification of weeds is, of course, essential to efficient weed control. It is particularly important in the case of new occurrences, where the landholder may not recognise the pest potentialities of the newcomer. The Department provides a free plant identification service and encourages farmers and others to submit specimens of plants so that they may be identified and suggestions made concerning eradication or control. Hundreds of such specimens are received each year, and among them there are, from time to time, new records for the State. In the past year, three weeds new to Queensland were submitted for identification.

On the research side, it is impracticable to devote detailed attention to each of the hundred or more weeds that are listed as being important to primary producers. Hence, it is desirable not only to establish priorities but also to avoid duplication of effort by those working on problems of weed control. These aims are accomplished by maintaining a continuous review through a committee representing the bodies concerned with weeds research and related matters. This committee, known as the State Weeds Co-ordinating Committee, meets from time to time to review the status of various weeds, to report progress in weed control, and to ensure that the efforts of constituent bodies are not wasted by duplication.

The Biological Section of the Department of Public Lands is conducting most of the work in progress in Queensland on the chemical control of pasture and stock route weeds and is also working on the chemical control of various farm weeds. The Bureau of Sugar Experiment Stations is carrying out work on weed control in cane plantations. The Department of Agriculture and Stock is experimenting with methods of chemical control of weeds in fruit and vegetable crops particularly.

The Department, in addition, has given much attention in recent years to the spraying of brigalow. Although not an invader of agricultural and pastoral land in the same sense as the true weeds, brigalow occupies many millions of acres that would profit by its eradication; hence it may be regarded as our most unwanted plant. The results of the spraying experiments and commercial sprayings to date suggest a distinct possibility of a high degree of success in brigalow eradication by aerial spraying with hormone preparations.

The agronomic approach to weed control is no less fruitful than the chemical line of attack and it is employed by the crop husbandry branches of the Department wherever it seems likely to yield good results. In particular, pasture improvement is reducing weed infestation of grasslands, and the sowing of vigorous pastures on cultivation lands is effective in controlling some serious weeds of crops.

The improvement of old-established pastures is very largely aimed at promoting the development of the better components at the expense of the worthless ones. Carpet grass, blady grass, and bracken are all being tackled in this

fashion in Departmental experiments. The use of a pasture in crop rotations is proving profitable in suppressing persistent weeds of cultivation as well as in other ways.

STAFF.

The staff position was again difficult for the year under review in so far as resignations and appointments of graduate staff are concerned. No fewer than seventeen graduates left the Department's service and there were only nine appointments to it, three of which, however, were appointments of Departmental University scholarship holders who had completed their academic training. Among the graduate resignations was that of Mr. R. D. Chester, the Officer-in-Charge of the Cattle Husbandry Branch, who resigned to take up a veterinary practice. The position with respect to agricultural college diplomates, however, was rather better, the four resignations being counterbalanced by eight appointments. In the case of the clerical staff, the appointment of 34 clerks and clerk typists more than compensated numerically for 21 resignations, but not in so far as experience is concerned.

With the assistance of funds provided by interested bodies, four Departmental officers proceeded overseas during 1954-55.

Mr. W. Webster, Director of the Division of Animal Industry, visited the United States and the United Kingdom, in connection with cattle tick control and other livestock matters. Mr. H. S. Hunter, Director of Marketing, examined the marketing situation and marketing practices in the United States, the United Kingdom, South Africa, and some European countries.

The Director of the Division of Plant Industry, Dr. W. A. T. Summerville, left Australia in May on a visit to the United States, the United Kingdom, and northern European countries to study agricultural extension organisation and other matters and to attend two international conferences. Mr. F. N. J. Milne, Poultry Husbandry Officer, attended the World's Poultry Congress in Edinburgh and visited several northern European countries to examine poultry husbandry practices.

ACKNOWLEDGMENTS.

Once again appreciation has to be expressed for assistance and courtesies received by this Department from Commonwealth and State Departments and Boards, from the Commonwealth Scientific and Industrial Research Organisation, and from the Universities of Queensland and Sydney. Much assistance and many courtesies have also been extended to the Department by primary producers' organisations, individual primary producers, manufacturers and distributors, and by the Press and the various radio stations.

Yours faithfully,

Acting Under Secretary.

DIVISIONAL DIRECTORS' SUMMARIES.

DIVISION OF PLANT INDUSTRY.

Director—Dr. W. A. T. Summerville.

STAFF.

Apart from cadets and temporary appointees, changes in the technical staff of the Division during the year involved 16 losses and 13 new appointments. The losses referred to included one death and three age limit retirements. Mr. W. J. Winchester (Senior Adviser in Agriculture and Manager of Kairi Regional Experiment Station) died suddenly in June at the early age of 47 years. The age-limit retirements were those of Mr. C. S. Clydesdale, (Senior Adviser in Agriculture), who is well known among primary producers and particularly the grain growers of the Darling Downs; and Mr. T. W. Lowry (Senior Inspector) and Mr. J. W. Brown (Inspector) of the Horticulture Branch, both of whom were highly esteemed by all who were associated with plant quarantine and markets inspectional work.

The technical staff of the Division finished the year numerically on the debit side. It must be realised that there was a further disadvantage in the reduction in the experience level as a result of losing the older officers mentioned and receiving resignations from a number of trained men who had enlarged their training in the Department.

Whilst the shortage of trained personnel makes itself felt in several directions, it is in the field of general agronomy and agrostology that it is most difficult to cope with the demand for our services. Officers of these categories represent what might be described as the general practitioners of agricultural science. They deal with such fundamental practical phases as land preparation, species and varieties of crops, and fertilizing of the soil—in fact, with management of the farm from the scientific angle. Consequently, staff shortages on this side adversely affect many aspects of the work of the Division in both investigation and extension. The shortages are not due to a lower proportion of University graduates being interested in this field than in more specialised studies. Men with this type of knowledge are much sought after and this explains why our losses of agronomists in particular have been heavy.

The Director of Agriculture has drawn attention to the large area of land under general agricultural crops in Queensland and to the increase of approximately 30 per cent during the past 10 years. Improved pastures cover a slightly greater area and it is safe to say that this total was achieved at an even faster rate of increase.

Such facts have a double significance to the Department. It may be claimed that a real proportion of the increases mentioned has been inspired as a result of the various surveys and trials carried out over the years by soils chemists, botanists, agronomists, and so on. On the other hand, development of this order continuously increases the calls from the farming community to the Department for both research and advisory services.

PASTURES.

It is once more desired to lay emphasis on the dependence of the economy of the State on our pastures. Any examination of the financial structure of Queensland quickly reveals that the great bulk of the natural income stems directly from grass. What is not quite so obvious is that grass can, should, and inevitably must contribute largely also in an indirect way. Grass is the finest rejuvenator of soil known or likely to be discovered. Its contribution is not measurable wholly in terms of wool, meat, milk, butter, and other animal products, but additionally in the maintained and enhanced returns from other crops.

It is therefore pleasing to be able to report that every year sees an appreciable increase in the practical interest our primary producers are taking in pastures. It is to be emphasised that this interest is not confined to producers concerned principally with stock raising, but is evidenced also by those who are mainly agricultural farmers. These men are coming to realise that alternate cropping and bare fallowing is not paying the dividends of earlier years.

In the forefront of the more advanced thinkers are the wheat farmers of the Darling Downs, an increasing number of whom are giving pastures the thought and practical attention they merit. Admittedly, in the first place this thought has been engendered possibly by a rather short-term desire to augment income and it cannot be accepted wholly as an appreciation of the essential soundness of a pasture phase in rotational farming. The motive is, however, of secondary importance, for irrespective of immediate effect on income, the inclusion of grass in any agricultural farm rotation must have long-term beneficial effects.

In the more direct role of pastures, producer interest in pasture management, noted over the past few years, has been at least maintained. Requests, by dairy farmers in particular, for technical guidance on pasture problems have been very numerous, a state of affairs which is most heartening from the point of view of a Department which has devoted much energy towards bringing about a realisation of the true status of pastures in primary production.

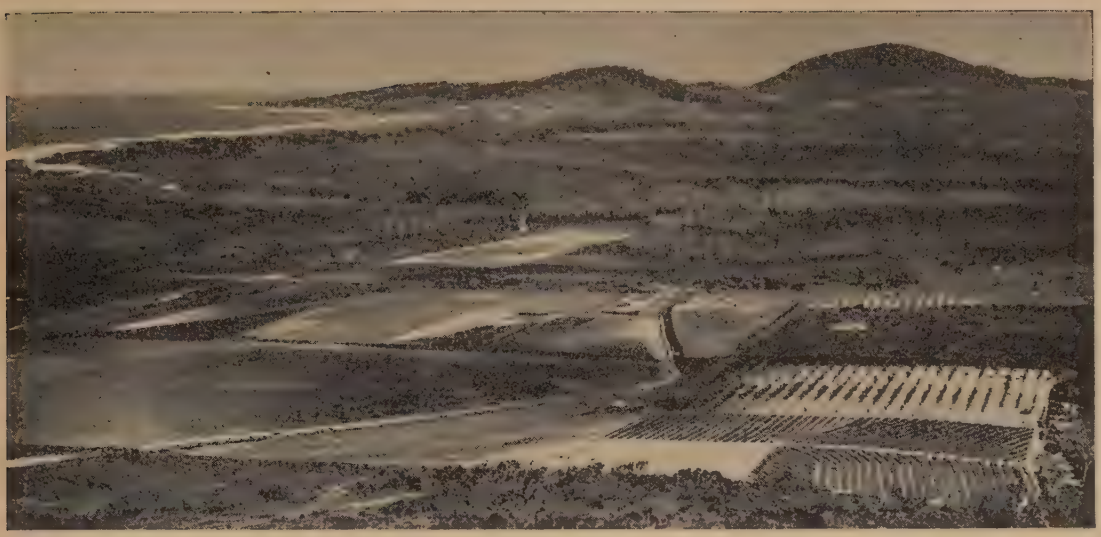


Plate 1.—View of Coolum Field Station, in the Wallum Country of the Near North Coast.

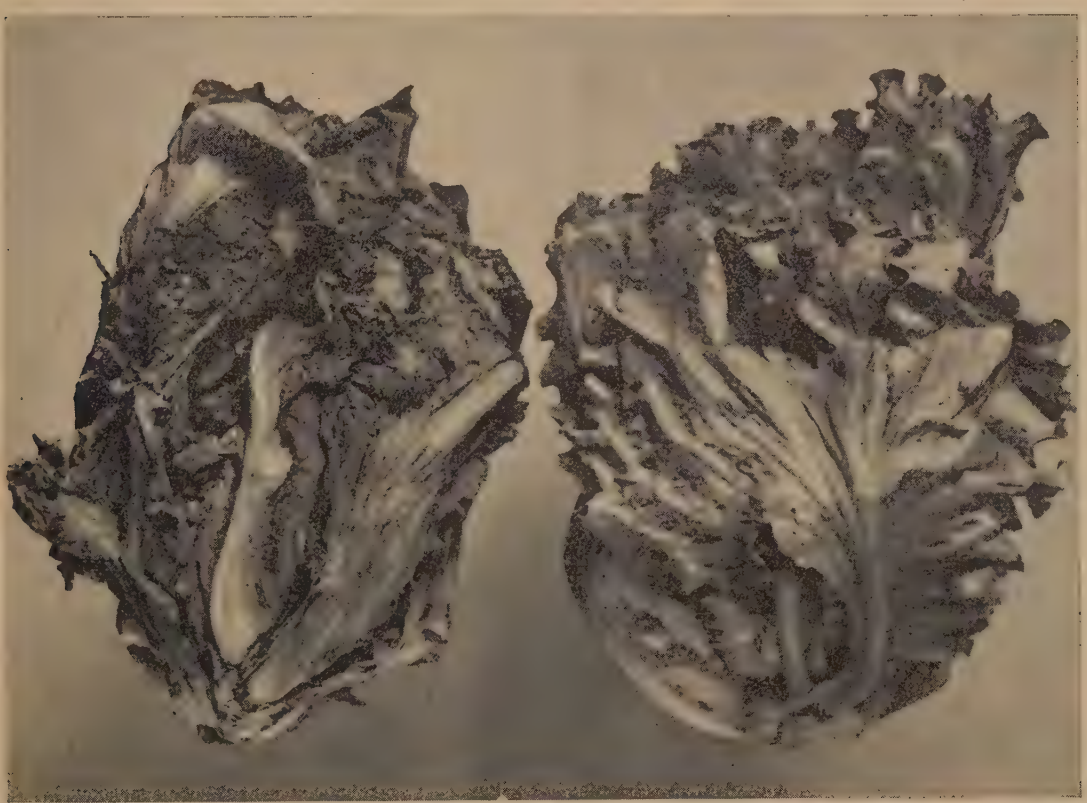


Plate 2.—Packaging of Fresh Vegetables. The lettuce on the right was kept in a polyethylene wrap for four weeks at 34 deg. F. The lettuce on the left, kept under the same conditions, was not wrapped.

Plate 3.—Cabbage Pest Control is Now Readily Achieved. The damaged plants were untreated.

Plate 4.—Brigalow Suckers After Aerial Spraying with Hormone Herbicide.

Plate 5.—A Young Banana Fertilizer Trial at the Ayr Station.

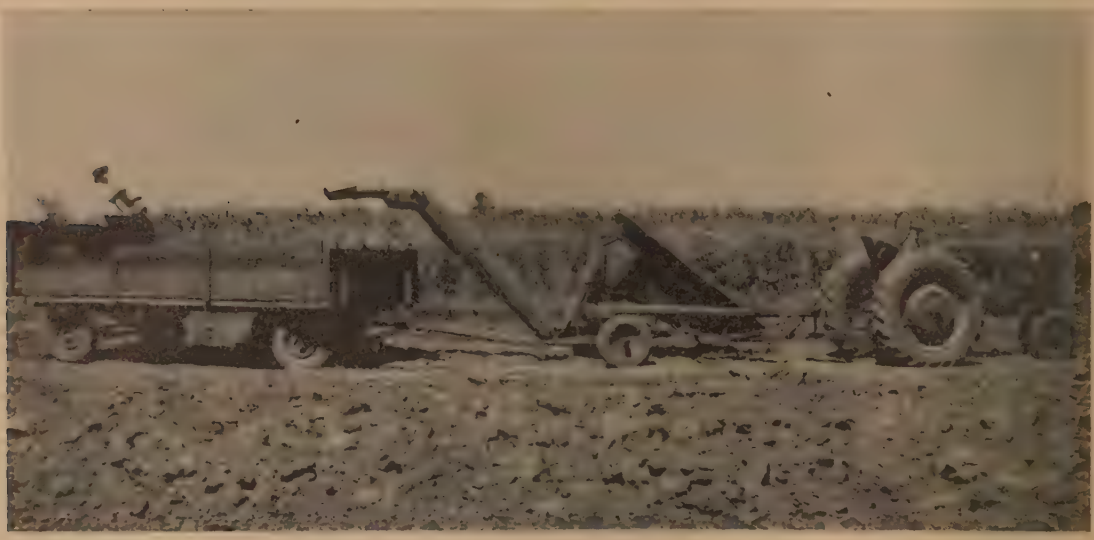


Plate 6.—Equipment Used in Ensiling Sugardrip Sweet Sorghum Yielding 15 Tons Per Acre at Biloela Station.

Plate 7.—Grazing Plot of Elephant Grass Strain Q2940 at Biloela Station. This plot yielded 70 tons of green material per acre in 12 months.

Pasture Improvement Competitions.

The 1954-55 pasture improvement competition which was conducted by the Royal National Agricultural and Industrial Association of Queensland evidenced great interest in pastures amongst primary producers. In these competitions Agriculture Branch officers of this Department in the various districts acted as seasonal assessors and the Senior Agrostologist was on the panel of judges.

The competition has been expanded for 1955-56 by the inclusion of another class of rain-grown pastures, giving three classes in all, namely, non-irrigated sown pastures in areas with a mean annual rainfall of less than 45 inches; non-irrigated sown pastures in areas with a mean annual rainfall of 45 inches and over; and irrigated pastures.

That further interest has been created is indicated by the fact that 85 entries have been received for the 1955-56 competition, compared with 29 entries in the competition just completed.

Buffel Grass.

Undoubtedly, one outstanding feature of recent developments in pastures generally has been the ever-increasing importance of buffel grass. There are many questions yet to be answered, but it can be said with confidence that buffel grass production will probably prove to be the greatest single advance for many years in Queensland's lower rainfall areas. The outstanding problems at the moment are threefold —the difficulty of obtaining seed, the sorting of strains, and the determination of the most efficient methods of buffel grass establishment over extensive tracts of country. The seed position should not be difficult to resolve when a steady demand for it develops, as it should then be reduced to a business proposition. In any case, the sowing of pilot strips and the gathering of seed by the landholders themselves for further plantings will make for economical use of available supplies. The situation with respect to varieties or strains will need to be handled with full knowledge. It is apparent that the differences between one strain and another may easily mean the difference between success and failure. To be attractive to graziers as a commercial venture, establishment methods will need to be easy and economical. Various methods of establishment are under test. No effort should be spared to develop the study of this grass.

As part of the effort now in train, the Senior Agrostologist, accompanied for portion of the journey by the Government Botanist, visited appropriate areas of north-western Queensland, the Northern Territory, and northern Western Australia.

Success in this study could be epoch-making and comparable economically in Queensland with the control of prickly pear.

Irrigated Pastures.

Producer interest in irrigated pastures continues to expand. More and more men are coming to realise that the possession of but a small acreage of irrigated paddocks gives an asset and an insurance out of all proportion to the area involved. The further realisation that small water storage can be effected with reasonable efficiency on many farms has given an impetus which should intensify in the near future. The general idea is not new, but the implementation of the idea through the use of modern machinery has brought fresh approaches and wider possibilities which farmers carrying stock would do well to examine in relation to their own properties.

"Brian Pastures."

What should be regarded as the first year of operations of "Brian Pastures," the 5,300-acre pasture research station near Gayndah, has been completed. It will be recollected that the Australian Meat Board undertook responsibility for the capital expenditure; this Department manages the station and has the major role in the research work, C.S.I.R.O. assisting.

Major structures, including residences and other buildings, main fence lines, stock-yards and watering facilities, were in use this year, and further developments are in progress. Basic stock required for the pasture experimental work and for maintaining the pastures under grazing conditions now total 519 head, with 139 calves. A number of experimental areas have been fenced and laid out to include various pasture mixtures and methods of establishment and management. A plant nursery has been established for various small-scale trials with pasture plants, for propagation purposes, and for holding small permanent stocks of potentially useful pasture plants. Associated with necessary ringbarking and eucalypt sucker control work on several hundred acres, the Government Botanist has laid down sucker control trials, to which he makes reference in his report. Standard soil conservation measures have been applied where considered necessary on the property.

Officers of the C.S.I.R.O. are conducting experiments with legumes on the granitic soil type to determine the fertility level of this poorer country.

It is gratefully acknowledged that the Australian Meat Board and the Australian Beef Cattle Research Committee have been most co-operative with the "Brian Pastures" Technical Committee, which lays down the research programme. The results of current and future research work on this station should prove of great value to the pastoral industries.

BRIGALOW CONTROL.

In any work with implications as far-reaching as the control of brigalow, there is an inevitable impatience for finality once promise of success is achieved. This impatience, however, is not the prerogative of any one section of the community, a point that is often overlooked. Our investigators also are most anxious to complete the brigalow work. However, in view of the amount of money that will be involved in the general adoption of any method of brigalow control, it is not in the best interests of either the State or the landholder to base advice on probabilities.

Of necessity, the experimental work is long-range. Since its commencement in 1951, it has included such aspects as aerial treatment of areas of virgin scrub, both aerial and ground treatment of sucker growth, aerial spraying followed by burning, the use of different chemical formulations and at different strengths, and applications at different seasons of the year. Owing to unseasonable weather conditions last winter, the planned winter treatment was deferred and awaits the winter of 1955. The purpose of such a trial was to discover the effects of spraying during a period of dormancy.

Sufficient progress has been made to show that aerial application of 2,4,5-T as the butyl ester, dissolved in oil, at the rate of 1 lb. per acre is a practical possibility. The precise conditions, however, have not as yet been evaluated. Admittedly, more than 100,000 acres of brigalow have been treated privately, but in spite of fairly close collaboration between the investigating officers and the operators, there have been some failures, the causes of which are being examined.

AGRICULTURE.

Tobacco.

It is most pleasing to be able to record the high level achieved by the tobacco industry of Queensland during the past year. In spite of a certain measure of adverse weather, which both directly and indirectly through disease incidence caused a reduction in potential yield, Queensland easily retains its lead in Commonwealth tobacco production, a record price was established at the Mareeba sales, and from the 1955 sales there was a 95 per cent. clearance. Australia's tobacco production is still well behind consumption and the market here is assured for quality leaf. Nevertheless, there are still many problems to be solved in what, after all, is a comparatively young Queensland industry.

The increasing appreciation of the assistance the industry can derive from research is well demonstrated by the moves made during recent months by the various parties interested in tobacco. Negotiations are well advanced which should ensure more efficient co-ordinated research in the problems affecting tobacco production in this country. Growers and manufacturers have given great stimulus both by their interest and by their willingness to make very substantial financial contributions. The greatest obstacle remaining to be overcome is the dearth of suitably trained scientists, and of course the growth of the industry hinges on obtaining and retaining the services of the right workers. Money for facilities alone will not ensure efficiency.

As a step towards strengthening the tobacco team work, a Senior Agronomist was appointed recently in the person of Mr. F. Chippendale, who was previously Senior Soils Technologist. In his earlier assignment Mr. Chippendale for several years had studied leaf quality in relation to soil and irrigation water problems. The Tobacco Experiment Stations acquired in the last year or so are still in their developmental stages, but material progress has been made.

Plant Breeding.

A vignette only can be given of the volume of work done under this heading. Reference must be made to the fact that in its third year of general distribution the wheat variety Spica attained the position of premier variety and covered more than one-sixth of the State's wheat acreage. In tests by the Agriculture Branch, Queensland hybrid maize varieties, in all maize districts except the Atherton Tableland, proved superior to the best of the open-pollinated types. Sorghum growers have greatly benefited from the production of certified sorghum seed with its assured quality and uniformity. A wide range of breeding work is in progress in this crop, including an endeavour to introduce midge-resistance into dwarf varieties.

Soil Erosion.

The continued and soaking rains received over many agricultural areas on at least two occasions during the period under review have served to accentuate the hazards of row cropping on soils vulnerable to erosion. The outlook of producers in our more susceptible regions has improved greatly over the past five years and there remain very few who have not some appreciation of the problem. There are, however, still too many who are prepared to take unwarranted risks. Unfortunately, amongst these are a large proportion who have some of our best soil. In fact, they take the risk because the soil is so good that some loss can be sustained without immediate disaster. Such men should realise that each and every occasion of loss of topsoil causes an increasing rate of decline of productivity, and obviously such losses cannot be subject to limitless repetition.

Agricultural Engineering.

One of the more recent advances in services rendered by the Division has been the provision of an advisory service on farm machinery. This may be taken as a natural outcome of the trend to mechanised farming. That is so, but two points need to be made. Firstly, advanced training in the subject is difficult to obtain in Australia and therefore suitable appointees are scarce. Secondly, there is a distinct limit to which the Department should or could go having regard to the legitimate sphere of machinery manufacturers and dealers. The Department cannot set out to cover every phase and contingency in farm machinery practice. Broadly, the ultimate aim is to help the farmer as much through advice to, and negotiation with, manufacturers and their agents as in any direct way.

SCIENCE.

Because of their fertility-building characteristics and their nutritional worth for stock, leguminous plants are assuming ever-increasing importance in Queensland. In both aspects the nitrogen-fixing potential is most important and this is bound up with the efficiency of the bacteria infecting the roots of the plant. It has been clearly shown that there are very marked differences in the efficiency of various strains of nitrogen-fixing organisms. This study has

Plate 8.—Spray Irrigating Pastures at Boonah.

Plate 9.—Buffel Grass Strains at Moggill. Three rows on right are strains of low vigour; two on left are vigorous types.

Plate 10.—Para Grass on the South Coast.

Plate 11.—Improved Pasture at Caboolture. Rhodes grass on poor clay country that has been drained and fertilized.

Plate 12.—Stacks of Lucerne Hay at Beaudesert.

Plate 13.—Stacks of Lucerne Hay and Shed for Baled Lucerne Hay, Boonah.

Plate 14.—Baled Lucerne Hay at Boonah.

Plate 15.—A Crop of Fodder Sorghum at Chinchilla Ready for Making Into Silage.

Plate 16.—A Load of Fodder Sorghum on a Buckrake at Chinchilla.

Plate 17.—Chopped Silage Being Consolidated in a Pit Silo at Yelarbon.

Plate 18.—Carting Mown Kikuyu Grass on a Buckrake to a Clamp Silo at Maleny.

made much progress over the past few years and it has been found necessary to have an officer of the Pathology Section devoting practically his whole time to the study of nitrogen fixation.

The activities of the Plant Pathology Section have of course been continued in their normal role, that of investigating the nature, symptoms, causal organisms, predisposing factors and means of control of the many diseases of plants. The report of the Chief Pathologist emphasises that unusual weather conditions, such as the cyclonic occurrences of the past year, can result in unusually severe damage by many of the diseases of cultivated plants.

In the final analysis, the test of an agricultural soil is whether a crop or crops will grow in it. From the same viewpoint, valid comparisons of soils not yet developed or exploited may be made by studies of the natural vegetation that has flourished on them over the ages. For this reason, botanical surveys are an essential part of land utilisation studies. Important additions to our knowledge of Queensland were made during the year by means of botanical surveys of particular areas, and of taxonomic studies linked with observations on distribution of characteristic groups of plants.

Similar ecological studies were undertaken in relation to distribution and spread of unwanted plants. The Botany Section has also carried out many trials of methods and materials for the control of such plants, of which the tests on brigalow, mentioned elsewhere, are of course the principal series.

Studies were extended on various drug-containing plants that are either poisonous to man or stock or contain valuable medicinal drugs.

In certain respects, the year in entomology has been one of consolidation. Several years of tobacco insect pest control investigations have been rounded off. In addition, considerable improvement has been made in the pest control schedules for vegetables and deciduous fruits. Detailed investigational work on nematodes, which are important pests of many crops, is enlarging and results from this work will be fundamental to improvement of nematode control measures.

The first 12 months since the proclamation of "The Fauna Conservation Act" have been satisfactorily concluded, and important projects associated with fauna conservation have been initiated.

AGRICULTURAL CHEMISTRY.

With strengthening of the staff of the Chemical Laboratory in certain directions, especially with respect to soils work, over the past three years it has been possible to reorientate the approach to many problems. The staff now is by no means confined to laboratory benches but takes its full share of work in the field. This policy has now been in operation sufficiently long to prove its worth. Our hopes have been fulfilled and in consequence it has been possible to establish closer liaison between this branch and the production branches. It is planned to develop further along these lines and the opening of regional laboratories will greatly assist. Work most affected has been that on the wallum soils, wheat, tobacco, and chemistry in relation to stock.

The wallum area, which represents a large proportion of the coastal terrain of south-eastern Queensland, has been shown to be highly acid and markedly infertile in respect of both major and micro (trace) plant nutrients. Experiments designed to find the economic levels at which soil acidity can be corrected and nutrients applied have been in progress, using as test plants various pasture species and some horticultural crops. Where comparatively heavy applications have been made, excellent results with some crops have been obtained. It is interesting to note that lucerne developed well on the poorest soil types when adequate nutrients were supplied. It must be stressed, however, that the major soil types are of low fertility and only liberal fertilizing of high-priced crops could be expected initially to make settlement of any appreciable area economically possible. Pineapples have been grown successfully.

Laboratory assessment of wheat quality for adjudication for show competition purposes has been done for the first time in Queensland. The survey of wheat quality has been continued.

Widespread chloride troubles have been encountered in tobacco, due to excess salts in either soils or irrigation waters. Almost equally widely distributed cases of micronutrient disorders in this crop have also been encountered.

The occurrence of copper deficiency and its effect on the livestock industries have been shown to encompass large areas of the State. These are being systematically mapped and remedial treatment formulated.

HORTICULTURE.

The Horticulture Branch provides the widest range of services of all branches in the Division, covering inspection, quarantine, extension, and investigational phases. Of these, the inspectorial services are the least appreciated, since individuals directly affected by inspections are naturally inclined to at least some resentment whilst those directly benefiting are concerned only when they feel the service is not being rigorous enough. During the year this inspection service was well tested when bunchy top disease of bananas occurred in the Innisfail area. Credit is due to those officers who detected the outbreak and to all those concerned in the subsequent eradication programme. This latter group incidentally includes owners of affected plants. With few exceptions, public co-operation was most satisfactory. The situation was quickly appreciated, and whilst close watch will be necessary for several years this dreaded menace to the industry appears to have been very effectively handled.

Investigational Work.

On the investigational side, the Branch covered a very wide range of enquiry in fruit and vegetable culture, crop and soil management, plant breeding and growth regulation.

As an example of the last-mentioned class of work may be quoted the use of a particular hormone spray, ANA, on developing pineapple fruit to delay maturity and increase fruit weight. In the previous year's work it had been demonstrated experimentally that cropping could be delayed by about ten days and a 20 per cent. increase in fruit weight could be obtained. This year the commercial application of the method was sponsored by the industry. This enabled the canneries to handle what proved to be a record pineapple crop with efficiency during the peak intake period. Such methods are factors that may well lead to an increase in the overall per acre yield of pineapples.

It may be mentioned also that the introduction of the Queensland-bred tomato variety Q3 to the Bowen area has enabled the cropping period there to be extended by 3-4 weeks into the warmer summer weather, a development that is of benefit both to growers and to consumers.

Food Preservation and Transport.

Under various headings in the report of the Director of Horticulture references will be found to work associated with food preservation, processing, and transport. Investigational work of this nature belongs properly to plant physiologists, and a nucleus staff, led by the Director himself, is so engaged.

The work has an importance far outweighing the solution of a particular industry's immediate problems of storage and transport. Even in that field, it will be seen that the work done in the year just ended represents a noticeable advancement of our knowledge of handling produce as various as apples, bananas, citrus, macadamia nuts, lettuce, cauliflowers, peas, and beans. The wider importance to which it is desired to refer is the contribution that the plant physiologist can make to the alternating problems of gluts and shortages. Where satisfactory methods of storage, preservation, or processing are available for commercial application, prices are stabilised, marketing can be more orderly, and the consumer is assured of continuity of supplies; additionally, as has been the case in apples with cold-storage methods, scope is provided for the expansion of the particular crop.

REGIONAL EXPERIMENT STATIONS.

The Regional Experiment Stations contribute original data on crops, rotations, pastures, and soil fertility studies and provide facilities for plant breeding and animal testing. Further, by virtue of the practical demonstrations they afford, the stations, now that the work on several of them is well advanced, have a very good extension value. That this is so is borne out both by the attendances of primary producers at field days on these properties and by the large number of men who have made individual visits or enquiries.

There is one point which it seems needs some clarification. Whilst it is true that these stations must be efficiently farmed if they are to give full value, it has also to be remembered that essentially their purpose is experimentation to obtain information that will help farmers. In this type of work new crops, varieties, and techniques are constantly being tested and it is inevitable that all cannot be successful. Similarly, some methods may be effective but uneconomic under existing circumstances. Other investigations require long-term study, as instanced by the eight-year rotations embracing crops and pastures that have been practised for several years at Biloela for cotton production and at Kairi for maize.

The value of these studies in rotations cannot be over-emphasised and a range of rotations embracing various pastures and crops will occupy an important place in the activities at each of these experiment stations. As an integral part of these studies, trials of a comprehensive range of grasses and legumes are conducted, first in introduction nurseries and then, with the more promising species, in small-scale yield and grazing plots. Complementary to this work, methods of seed production and harvesting are evolved to ensure that ample supplies of seed become quickly available when new species are discovered that warrant commercial usage. In this respect, very promising progress has been achieved in the seed-harvesting investigations conducted at Biloela.

A very important feature of the activities this year has been the commencement of operations at the new Experiment Station at Millaroo, some 40 miles upstream from Ayr in the Burdekin River Valley. With capital expenditure financed by the Burdekin River Authority and annual recurring expenses financed by the Department of Agriculture and Stock, this Experiment Station is being developed and operated by the Department to provide facilities for studying the agricultural and pastoral possibilities of the levees and flood plains in the main Burdekin River Valley. Preliminary studies of these possibilities were started at the Regional Experiment Station near Ayr in 1948 to obtain information that would allow of the initiation of a large-scale programme of the most promising investigations, embracing irrigated pastures and crops, as soon as the Millaroo area became available. More or less centrally located for some 184 farms that are now in the course of development, this Station embraces both the lighter levee soils and the heavier soils representative of several hundred thousand acres of the flood plains. It is well situated, therefore, to assist in the development of the middle and upper sections of the Burdekin River Irrigation Project.

EXTENSION ACTIVITIES.

During recent years, there has been a movement towards improving the advisory services available to primary producers. It has been recognised that while our best farmers compare very well with the best elsewhere, there is a wide gap between the best and the average, and a still wider gap between the best and the poorest. Allowing for all natural discrepancies accruing from variations in soil, climate, location and the like, it is still evident that the average could improve and that the poorest would greatly benefit were they to apply knowledge in the possession of the better producers and of Departmental officers. Particularly during this period when strength of staff is a matter of concern, it is felt that improved methods of disseminating

information are of special importance. Accordingly, the problem of how to increase efficiency in the advisory or extension service is being closely and continuously examined. As one step towards increased efficiency, a school of instruction in extension methods for Division of Plant Industry officers was held during the year. Here, full advantage was taken of knowledge gained by Mr. G. R. Moule during a study visit to the United States of America. It is hoped and believed that the school will prove to have been of considerable value; the results will be closely followed.

Officers of the Division have continued to avail themselves of every possible opportunity for carrying out extension work, aside from the more obvious use of articles in and extracts from the *"Queensland Agricultural Journal,"* correspondence, and officer-to-farmer contacts. Other methods have included the use of experiment and demonstration plots, the organising of field days and discussion groups, meetings with producer representatives and lectures to farmers' meetings, radio talks and approved contributions to the Press and to industry journals, instructional schools for farmers and farmers' sons, grading and packing classes both for farmers and for school children in country districts, exhibits and judging at agricultural and horticultural shows, assisting in the organising and judging of pasture and crop competitions, and participating as lecturers in the Adult Education Scheme. A number of instructional films in colour have been prepared by officers and these, together with colour slides and other illustrative material, are circulated and used at grower gatherings.

Advisory Committees.

Behind the extension officers there are of course the groups of specialist officers, each working on particular problems. It is pleasing to record the ever-increasing interest, assistance and co-operation by producers and producer organisations in the planning and progress of the research programmes, per medium of the several advisory committees. In some cases financial assistance is given towards particular phases of work that have not otherwise been provided for; in others there are the organised co-operators; in all cases the producer representatives bring to the committee table the considered wishes or needs of the particular industry for discussion with the senior officers concerned. Such committees in themselves could easily be regarded as a special form of extension work. They certainly constitute a valued avenue by which Departmental activities may become directly known to the leaders in the industry.

In this way there is linkage between the Department and the pineapple, citrus, avocado, macadamia nut and vegetable growers. Aside from those industries with which advisory committees have been organised, close liaison has been well maintained with all sections of the Committee of Direction of Fruit Marketing. The C.O.D. in its various sections has made substantial contributions to research work. In like manner, the Dairy Pasture Improvement Committee has been of material assistance in the pasture investigations. The Cereals Advisory Committee has engaged in very valuable discussions on the trends in cereal investigations and in informative visits to several of the experiment areas on the Darling Downs.

Interstate Visits.

A number of officers during the year were selected for visits to other States, either to represent this State at important official conferences or to make study visits in specialist fields.

In this way the Department was represented at the Pan-Indian Ocean Science Association meeting in Perth. Senior officers attended conferences on such subjects as tobacco research, plant quarantine, weeds, soil conservation, and cereal chemistry. Study visits included one to northern districts of Western Australia on buffel grass and pastures generally, to South Australia on soils survey work, and to Victoria on irrigation matters. Certain officers specialising in tobacco production were selected to visit southern factories to gain experience in grading and handling leaf under conditions of manufacture, and three plant pathologists participated in a plant disease conference.

DIVISION OF ANIMAL INDUSTRY.

Director: Mr. W. Webster.

The past year has been notable for the realistic approach taken to what are considered the main problems of the animal industries. This approach has been developed over the last few years and the stage has now been reached when in each branch of the Division, work is concentrating on the bigger problems whilst less time is spent on the smaller, albeit at times equally interesting ones. There is good co-operation between Branches and Divisions and work is developing along broad lines wherever possible, with team work continuing and expanding.

In the husbandry field, work directed towards the mitigation of drought and seasonal shortage of fodder is developing. Work aimed at increasing the genetic worth of the economic animals is well established. In collaboration with other Divisions, the expansion of mixed farming and the association of animals with agriculture is being encouraged to the mutual advantage of animal and crop production.

Investigations of mineral deficiency continue with some successes and some disappointments, but the latter have encouraged more extensive investigations.

The grading of meats has established a principle which can be developed to encourage the production of a higher quality article. This has occurred in the pig industry, where the virtual disappearance of overfat pigs and the increase of high-quality bacon from a low to a very high proportion of production developed within a few months of the introduction of grading.

Tuberculin testing of dairy cattle has reached the stage where very few areas are not included in the scheme. More than three-quarters of a million dairy cattle are now under test. A survey of tuberculosis in beef cattle has demonstrated a widespread incidence of the disease in northern Queensland, with indications that it is being spread by sale bulls.

The control of contagious pleuropneumonia by the industry through the special staff engaged in this form of extension work has been highly successful and the preventive inoculation of cattle has expanded to such an extent that the manufacturers of the vaccine are having difficulty in keeping pace with the demands of the industry.

The change from breeding by individual selection on appearance to selection by measurement, and particularly the recorded results of breeding, is being developed in all Branches. This is well established in the Sheep and Wool Branch but has commenced in all other husbandry Branches. This will in some industries, at least, lead to the use of artificial insemination, the development of which and the use of deep-frozen semen are being examined.

The search for better diagnostic tests for vibriosis and trichomoniasis has met with some success, and as a result it is now evident that vibriosis is widespread in Queensland.

Through the feeding of suspect plants, a further step has been taken in demonstrating the cause of wallum disease of cattle.

The successful work with leptospirosis is continuing, particularly on its relationship to abortion in sows.

The immunisation of bulls against tick fever, the preparation of bleeders, the distribution of vaccines and the usual services given by the Yeerongpilly and Oonoonba laboratories continue at much the same average tempo and represent a substantial part of the work of the staff.

The newly formed husbandry research section is developing at a satisfactory pace and is already showing results. Work on the evaluation of breeds has given some interesting indications, particularly in relation to the influence cattle bred in one environment have on the breed when used in another environment, as is the case in the Queensland beef industry. Work concerning the drought feeding of cattle is about to commence and the results will be watched with interest.

STAFF.

Although there have been a considerable number of appointments during the year, there have also been numerous staff losses. This is very serious, for the gains have been mainly young untried staff, whilst most of the losses have been of trained men, some of them in key positions. Whilst it is hoped to replace these men, it will probably be some years before their loss is overcome, for they were men who had been specially trained, not only for the work they were doing, but for more senior positions for which they had the capacity.

SEASONAL CONDITIONS.

There has been a more even distribution of rain in the State as a whole than usual, making pasture growth fairly constant throughout the year. However, the Barkly Tablelands, and to a lesser extent the Burnett, eastern Darling Downs, and Atherton Tablelands did not enjoy good conditions until late summer. It should be remembered that the previous year had also been better than average, particularly in the winter, and the State came through to the spring of 1954 with a good body of feed, again with the exception of the Barkly Tablelands.

Excellent pastures made the mating season very favourable and lambings and calvings were above average. This has brought about a further increase in both beef cattle and sheep populations and the losses of recent seasons have now been made good. Better pastures and crops have ensured heavy production during 1955.

On the debit side, flooding caused serious stock losses in restricted areas, and damage to summer crops and pasture further reduced production in these areas. The abnormally wet seasonal conditions, particularly during the winter of 1954, increased and hastened tick regeneration. The extension of ticks in marginal areas was greater than for many years past and the incidence much heavier in normally infested areas. Fortunately, the dry season in the Barkly Tablelands did not favour tick life and so the movement of cattle from the Northern Territory into Queensland was not complicated by extensions of the tick-infested area as was the case several years ago. The movement was on a smaller scale than usual.

Persistent rains caused a delay in mustering but produced good pasturage which will allow the season to continue to a later date in 1955. They also had an effect on the 1954 wheat crop and grain returns were lower than usual, but ample feed still appears to be available for the pig and poultry industries.

Wet conditions caused serious blowfly waves and made internal parasites more troublesome in the sheep industry.

PRODUCTION.

A steady increase in production has been maintained in both the beef and sheep industries, due largely to seasonal conditions already described. General improvement in prices has had a big effect in the beef industry at least, both directly and indirectly. It is to be hoped that the present drop in beef prices is only temporary and the recent price levels will soon be restored.

One interesting development has been the movement of cattle by sea from Cape York Peninsula to Cairns. This commenced as a movement of fat cattle to the abattoirs near Cairns. Owing to the unimproved nature of the cattle country in the Peninsula, it has not always been possible to obtain a regular supply of cattle of the one age, grade, or quality, and there are indications that the cattle eventually moved will be mostly stores for fattening in other areas. This is the type of trade already developed in the Peninsula but dependent on stock routes being open. The new type of movement may extend the trade to times of the year when the stock routes are not suitable for droving owing to lack of water and feed. The cattle are taken by a converted landing barge through comparatively calm waters inside the Great Barrier Reef from the coastal rivers to Cairns and vicinity. Approximately 5,000 head were moved this year.

Another interesting development is the movement of slaughter and breeding cattle from Queensland to the Philippines, 2,500 cattle being shipped from northern ports. One of these consignments was taken by barge from shallow coastal rivers and transhipped in deep waters to an overseas vessel which took the cattle on to the Philippines. Whether this trade will continue in its present form or develop into carcase shipments remains to be seen, but it indicates the possibilities of a trade with the South-east Asian countries in cattle that would be difficult to market in southern States of the Commonwealth.

Poultry production has remained remarkably high despite a serious fall in overseas prices for eggs and egg pulp. It is certain, though, that a testing time lies ahead. Prices for grain sorghum are lower than pertain in other States, and this together with increased use of the grain has assisted Queensland poultry farmers very considerably.

As in other States, the development of a broiler trade seems to have possibilities and could be extended considerably at times when grain prices are favourable. The development of the prepackaged poultry meat trade and the vacuum pack now used for poultry will all help to encourage and popularise broilers. It is hoped that male chicks can now be used and that in future we shall not see the wholesale destruction of previous years.

The continuing change from cream to whole-milk production has affected pig production in the dairying areas. Reasonable grain prices, improved availability of protein-rich foods and favourable crop production have, however, kept up pig supplies, and in fact there has been a slight increase.

The over-supply of the British pigmeats market from domestic and other sources reduced the need for imports from Australia, and with high local retail prices the industry here was in serious trouble. Reduction in local retail prices, the establishment of grades and the decision that low prices would be paid for over-fat pigs has brought about an amazing change. This is an example which might well be followed by other industries. The payment of incentive prices for quality will increase efficiency and Australia may then hold its own on the competitive markets that now exist.

COMBINED EFFORTS BRING RESULTS.

Team work within the Division, within the Department, and with the industry continues. The assistance given by industry representatives on the Poultry Advisory Board is very real and has made it possible for some important work to be undertaken. Random sample testing described in more detail in other parts of the report has had the support and assistance of this Board and should be of lasting value to the breeder and the producer.

Similarly, the Pastoral Advisory Committee, though more recently formed, has been responsible for much closer liaison with the industry. Joint work at "Brian Pastures" by the Divisions of Plant Industry and Animal Industry is continuing, and although necessarily of a long-range nature has made possible the development of projects that would otherwise have been impracticable.

The demonstration of increased production of dairy cattle by the use of crops and improved pasture has been financed by funds from the Commonwealth Dairy Industry Extension Grant and is the result of joint work by the Divisions of Animal Industry, Plant Industry, and Dairying.

Experiments and field demonstrations concerning copper deficiency by staff of the Research, Sheep Husbandry, Cattle Husbandry, and Chemical Laboratory Branches could only have been successfully undertaken as joint projects. Similarly, sheep body strike trials and deep litter trials for pigs were of more value as the result of assistance from Branches other than those directly concerned.

It is to be hoped that the goodwill within the Division, between Divisions and the industry and other organisations continues, for without it we can only partly succeed.

SELECTION OF LIVESTOCK ON MEASUREMENT.

The types of domestic animals and the breeds within these types have been developed according to the needs of the consumer and the requirements of the industry. The fixing of breed type suited to the particular kind of production in a special environment has usually been the work of one individual. The development of the breed has been carried on by a long line of breeders who, within certain limits, have improved the breed to a high standard. Whilst competitive buying has helped to a large extent, the show-ring has been of more importance in bringing this about. It is now apparent that something more is needed if our breeds of domestic animals are to be further improved and increased efficiency of production result.

It is agreed that in the case of animals producing meat and wool, the production of the animal can be easily seen, but up till now very little in the way of records of performance has been kept and breed improvements attempted on that basis. The need for the keeping of such records is even more apparent in the breeds and types where production is only indirectly related to show-ring appearance. Whilst it would appear that there is some relationship between body conformation and production, further improvement and selection by this method would necessarily be very slow.

Individuals in the industries have played their part by consistently working towards herd improvement and this in turn must eventually help the general quality of the breeds. There has hitherto, however, been no concerted move to bring this about, and in some industries the production of high quality breeding sires has been in places far removed and in a different environment from the herds in which they are to be used. Breeding is, of course, only part of the story. Nutrition plays a very big part, but where livestock are fed adequately, as they are in some of the industries, the genetic capacity of a breed can best be improved by selection on measurement.

It is interesting to note, therefore, that there is now a concerted move in all the animal industries to increase and improve production through selection by measuring the production of individuals and groups.

In the beef industry, work has commenced on the grading of herds into a number of groups. The groups are not selected on a herd basis but according to a set of standards laid down for the whole industry. These standards have been in use in the U.S.A. for some years, but have only just recently been used in Queensland. There are six groups of standards of excellence for both bulls and cows.

The idea is to use bulls of one grade higher than the cows so that a gradual increase in quality can be brought about. It may be said that this in effect is what the industry has been doing for years, but it is pointed out that no attempt has been made to record or grade breeding stock according to fixed standards, nor have bulls of these standards been available. The work is in a very early stage, but is a real attempt to encourage beef breeders to attempt controlled improvement.

In the demonstration work, regular weighings are recorded so that results can be demonstrated and it is possible that weighing of this type may be essential for the stud breeder. The breeder of slaughter cattle can use other forms of measurement made possible by the nature of his trade.

Sheep breeding in Australia is much further advanced, for in the studs at least grading and recording have been common. There has, however, been no complete method of measurement of the production of the individual and little attempt at recording the results of breeding on the average property. During recent years, extension staff of the Sheep and Wool Branch have been actively engaged in changing this state of affairs and in addition a wool laboratory has been established to measure the results of breeding.

There has been a steady increase in the cut per head of wool in Queensland during the last 50 years, and it is estimated that half of this is due to breeding. As the industry is dependent on the stud breeder for the supply of rams, improvement in the studs is fairly quickly reflected in the industry.

The wool laboratory can advise the stud breeder of the amount of clean scoured wool his sheep grow, the yield of the fleece, length of staple, density, quality, and the ratio of wool to hair follicles in the skin. Armed with this knowledge he is in a much stronger position to assess the productive capacity of his stock and thus can improve his stock more quickly and pass on this improvement to the industry. An increasing number of stud breeders in the State are now availing themselves of this service, which already has been responsible for an appreciable increase in the rate of genetic improvement.

During recent years, there appears to have been a decrease in the average egg production of hens in Australia. At least, there seems to be a lower average production from Australian hens than is reported for hens overseas. It is felt that the efficiency of the Australian poultry farmer is comparable with that of farmers overseas and there does not appear to be any marked difference in the standard of nutrition for the fowls kept. Again, it is likely that there is no greater loss from disease in this country than abroad; in fact, the reverse is probable. It therefore would appear that the genetic capacity

Plate 1.—Portable Tubular Steel Cattle Crush, Used for Vaccinating Cattle Against Pleuropneumonia.

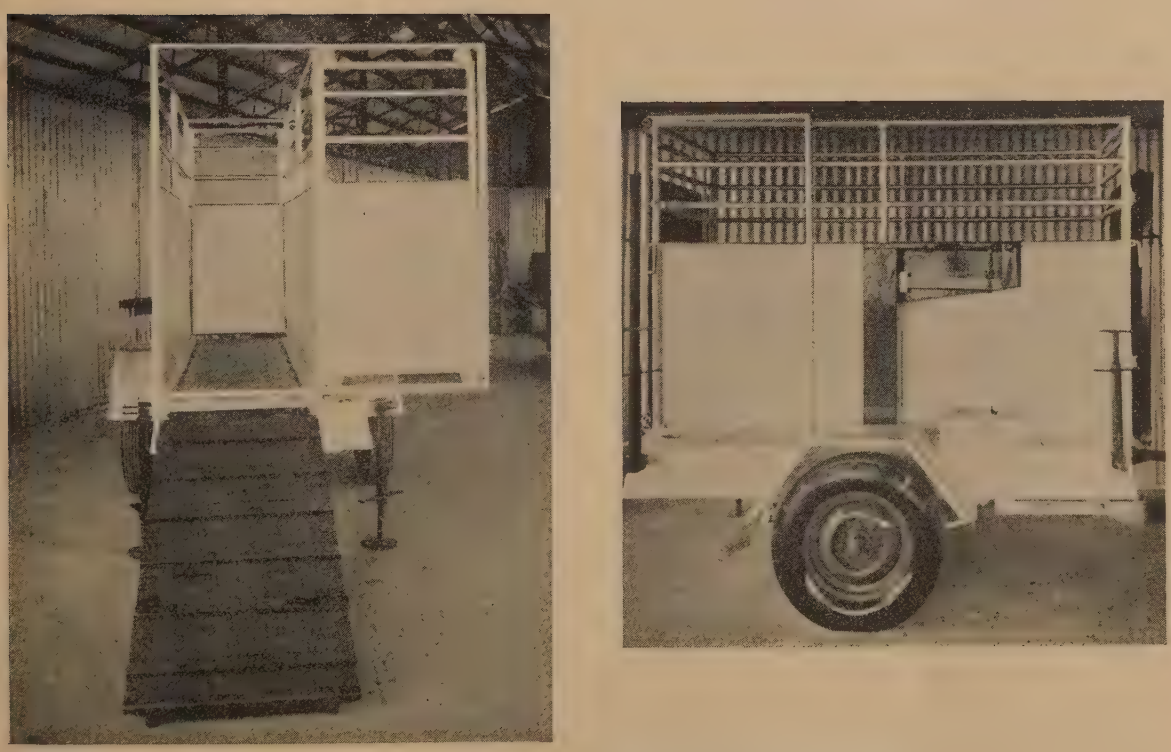


Plate 2.—Two Views of a Mobile Cattle Weighbridge Designed and Built for Cattle Husbandry Branch Growth Studies.

of Australian hens is not as high as that in some overseas countries. It is possible that the heavy demand for stock during the war and the early post-war period has brought about a lowering of the breeders' standards. The intensive system of poultry management in the absence of laying cages or trap nests makes it virtually impossible for the breeder to assess production of individual hens or of families. It thus prevents his using methods of selection and would tend to develop high producing strains.

For many years, egg-laying competitions have been held in the various States, but these tests have the disadvantage of only measuring individual birds specially selected by the breeder and are not an indication of the production average of his flock. There is now a preferable system of measurement, known as the random sample production trial, which if properly conducted gives a reliable indication of the average production of a flock, and if used in association with trap nesting or cages can show up outstanding individual layers. In Queensland the trial involves the random selection of one gross of eggs during an unannounced visit to each breeding establishment entering in the trial. These eggs are hatched at the trial centre and all the pullet chickens reared in a common environment. At the end of the rearing stage 30 pullets are selected at random and for each entrant production of eggs recorded for a definite period. Thus records of mortality among the mature birds are also kept, and hatchability, rearability, production, and livability are measured. This gives the breeder an opportunity of measuring the capacity of his stock and the purchaser of day-old chicks the opportunity of relating his purchases to the known capacity of flocks.

It is hoped by this system to present the breeder with an opportunity of improving the quality of his flock by using high producing strains and so eventually to bring about higher average production in the industry.

Random sample trials have been commenced by the Poultry Branch of the Division and the results of the first year's Departmental random sample trial are awaited with interest.

The selection of pigs for breeding can be made on sight for some characters such as length, depth, and general appearance, but it is only possible to fully measure the important characters of ratio of fat to lean, muscle thickness, &c., by cutting the side and measuring fat depth. It is also only possible to compare the capacity of pigs for converting fodder to meat or fat by feeding them from weaning to bacon weight in a common environment with standard rations. Thus we have the idea of a pig testing station to measure the genetic capacity of boars by testing a proportion of their progeny. In this way, it is possible to discover boars capable of siring pigs that will score above average when killed as baconers after being reared in the standard environment of a pig testing station.

For many years, the butterfat production of dairy cattle has been measured by the Babcock test and partial herd testing. Bulls producing these cattle have been judged for their quality in the show-ring. In more recent years, an attempt has been made to assess the bull by the performance of his daughters, but until whole-herd testing was introduced, accurate measurement was difficult. This form of measurement is now assisting in the search for bulls that can be used for increasing the general production of breeds. The difficulty in this work, of course, is the big variation in the level of nutrition in the various dairy herds. To overcome this the Division is commencing an ambitious scheme of artificial insemination in which the semen from four young bulls is used in a number of herds. An equal number of females in each herd is inseminated by the semen of each bull so that there will be a comparison of the progeny of each bull reared in the same environment and with a similar level of nutrition.

It will thus be seen that forms of measurement other than the show-ring are now being used to assist the breeder is assessing the productive capacity of livestock and particularly the sire's ability to transmit his qualities to his offspring. Systems of measurement such as those outlined give the breeder an opportunity of selecting the animals best able to improve the breed. All this suggests that artificial insemination may be the quickest way of spreading this improvement.

MEAT INSPECTION.

In Queensland the term meat inspection is interpreted in its widest sense. Here it has not been our aim to appoint a team of men to search for diseased meat and condemn it as their only duty. Rather has it been the aim of the Department, whilst giving due regard to the wholesomeness of meat, to try and prevent unnecessary wastage and at the same time to pay careful attention to the quality of the article and the hygiene of its preparation.

The legislation controlling the slaughter and distribution of meat in Queensland is wide enough to control the retail sale of this product. Because of this, it has been possible to plan broadly and bring about developments that are to the benefit of the consumer, the producer, and the trade alike.

Provision has also been made to prevent wastage in the industry by the erection of local abattoirs capable of dealing with the by-products that are either wasted or used uneconomically in the small slaughterhouse. During the year the first of these was opened at Toowoomba and a number of other towns are making preliminary arrangements for the erection of abattoirs.

The expansion of the grading system during the year was an important step forward, and with careful attention being given to changing trends in the industry, influenced by consumers' preferences both here and overseas, it should be of advantage to all.

Grading will eventually be a great help to the field extension services, for a producer must have the advantage of payment for quality before he can be persuaded to produce a prime quality article. No better example of this can be seen than the recent grading of bacon carcases. In a remarkably short space of time,

first-grade carcases increased from about 10 per cent. to approximately 75 per cent., because higher prices were offered for this grade and much reduced prices for the overfat carcase.

It is noticeable that Queenslanders are not very fond of mutton. This might be difficult to understand until it is realised that the Merino breed represents over 99 per cent. of the sheep in Queensland. The staff of the Sheep and Wool Branch have during the past few years been trying to encourage the development of a small fat lamb industry close to Brisbane to supply the local market. It is realised that high wool prices make this difficult, but a special grade for high quality lamb carrying an incentive price could encourage the development of this trade and help to develop a taste for this high quality article which is so popular in the other States of the Commonwealth.

There has been a very obvious improvement in retail butcher shops in recent years, particularly in the development of refrigeration and the use of impervious tiles, stainless steel and similar materials. These are not only attractive but improve, through easier cleaning, the hygiene of the shop.

It has been noticeable in recent years that self-service of all foodstuffs is developing, with apparent reduction in price to the consumer. This trend is now developing in the meat trade and is well established in some overseas countries. Realising that this new type of selling was interesting the meat trade in Queensland, regulations governing it have been gazetted and the staff given some training in the new procedure. Some retailers have already installed equipment and are selling pre-wrapped meats, whilst others are giving the system very serious consideration with a view to its installation.

The uncertainty in the meat industry due to changing world markets and consumer demands makes the task of the extension staff very difficult.

For some years now the demand has been for more meat of a certain type. Realising that the demand for higher quality younger beef was likely to increase, there was a forward move to recommence shipment of chilled meat to the United Kingdom. This did not seem to have the full support of all exporters and the difficulties were freely quoted. There now appears to be a very strong set against frozen meat in the United Kingdom and prices have fallen. There also appears to be a strong objection to fat by the overseas consumer and a realisation by the cattle fattener that fat costs more money to produce than meat.

It is known that the consumer is more interested in tenderness than flavour, as is made very clear by the development of the yearling beef trade in Australia. It would seem that if the Australian producer could bring his cattle to slaughter weights at a younger age, this would produce the type of carcase required. This should be possible on good pastures or with a limited amount of crop feeding. There is reason to believe that the Queensland pastoralist in the better improved country can produce what is being called in England the "unfinished carcase," for this is the type of meat the Australian consumer prefers. What is crystal clear, however, and has been for some time, is the need for the production of a carcase from a young animal and the sending forward of a younger store.

With the meat trade going through a difficult period and the obvious uncertainty of the trade concerning future developments, it is difficult for the extension services of a State Department of Agriculture to advise cattlemen, either breeders or fatteners, how to develop and improve their methods. This is increasingly difficult in an industry where the production of the finished article takes time and changes cannot be made quickly. The development of the Cattle Husbandry Branch within the last few years and the more recent appointment of a veterinarian to specialise full-time in meat inspection and marketing make it possible to keep in touch with changing trends. It is hoped that it will soon be clear how the trade will develop so that extension work can be placed on the most effective basis.

SOME EFFECTS OF COMMONWEALTH GRANTS.

The facilities provided by the two Commonwealth Grants, the Dairy Extension and the Extension Services, are having a noticeable impact on the primary industries of the State. Funds available from these Grants have been used in all of the Branches of the Division with the exception of the Sheep and Wool Branch.

Although the proportion of the funds that has been expended has varied between the various livestock industries, there are nonetheless visible signs of the impact made by the Grants on all those industries.

These effects are both direct and indirect in nature. The direct effects are immediately apparent to an observer. They include the whole range of demonstrations that have been undertaken in recent years with Grant funds—demonstrations of fodder conservation, contagious pleuropneumonia control, mineral deficiency correction, bush hay production, poultry vitamin A supplementation, and numerous other problems of the industries.

The demonstrations represent attacks on the problems of the industries by producer and extension officer in close collaboration. They are wherever possible planned on such a scale that the benefits derived from the demonstration programme would have an appreciable and significant bearing on farm or station management and preferably on efficiency and output of production. They are, in essence, practical field-scale situations that are capable of being repeated by neighbouring producers with average resources on their own properties.

The indirect effects on the industry are not so immediately apparent. They are, however, of even greater long-term importance to the livestock industries than the direct effects, and will have an impact on the industry of increasing magnitude with the passage of time.

It has been very noticeable in the past two or three years that discussion groups of one form or another have been developing within the primary industries. Practical men with common problems are meeting and discussing those problems. They are taking steps to seek their solution and to apply new production methods. It is apparent that the development of these groups has been materially assisted by the large range of demonstrations on producers' properties. Here are available for study and discussion the methods which can be used to solve local problems and, furthermore, the results that can be expected to accrue.

Assistance in the development of such groups and encouragement of them once formed are becoming noticeable features of the work of field officers of the Division.

These developments within the industries are associated with a change in outlook of the individual officer to his work as an adviser in technical matters to rural communities. This change is being brought about by a combination of factors, but includes mainly the periodic in-service schools on extension methods, the discussion and lecture sessions already held at some of the larger country centres, and joint planning between producer organisation and technical officer that has been a feature of the demonstration programme.

The momentum of this change in outlook is still increasing within the Division's extension services and will continue to have an important bearing on the livestock industries in the future. The results can only be mutually beneficial to producer and extension officer alike.

DIVISION OF DAIRYING.

Director: Mr. E. B. Rice.

During the year under review butter and cheese were again sold on the British market under free trading conditions for the first time since complete control of purchases and distribution was assumed by the British Ministry of Food in 1940. However, the quantity under partial control of the Ministry still represented nearly half the importations into Britain, as the Danish and Australian contracts with the British Government did not terminate until 30th June, 1955; the prices received by the Ministry of Food upon resale on the free market were below the contract prices paid. From 1st July, 1955, there will be a complete reversion to trader-to-trader marketing. Supply and demand will thus mainly determine future market prospects and prices.

Plans are being prepared by the Australian Dairy Produce Board with a view to implementing a scheme, in co-operation with dairy produce marketing organisations of other main dairy exporting countries, to assist in achieving stability of prices on the United Kingdom market.

The open market prices received for Australian butter during the year were lower than those of Danish and New Zealand. The desirability of placing on the British market the maximum possible proportion of choice grade butter is clearly indicated if our butter is to compete successfully not only with butters of other countries but also with butter substitutes.

The Commonwealth Government early in 1954 appointed a Dairy Industry Investigation Committee to investigate and report on the guaranteed price to be paid to producers for the year. The Committee's recommendation, which was accepted by the Government, was that the price of 49.27d. per lb. commercial butter, which prevailed in the two previous years, should be continued for 1954-55. This guaranteed price related to the quantity of butter and cheese consumed within Australia, plus a quantity of the exportable surplus up to 20 per cent. of local consumption.

SEASONAL CONDITIONS.

Good seasonal conditions which prevailed throughout most of the year were conducive to pastures maintaining growth and nutritive values over a longer period than normal and to good growing conditions for fodder crops during both winter and summer months. As a consequence, dairy cattle were in good condition at all times and production was appreciably higher than in the preceding year. Nevertheless, production was affected in some districts by damage to pastures and crops by three cyclones which occurred during the year. The estimated total output of milk was 264 million gallons.

THE BUTTER INDUSTRY.

Butter production was 45,915 tons, being 4,117 tons in excess of that of the previous year. Of this amount 35,099 tons, or 76.44 per cent., was officially graded by Commonwealth and State Graders. The results were choice 36·79 per cent., first 54·47 per cent., second and other 8·74 per cent. The gradings for the past three years are given in Table 1.

TABLE 1.

BUTTER GRADES.

Grade.	1952–53.	1953–54.	1954–55.
	%	%	%
Choice	46·96	29·81	36·79
First	46·75	61·71	54·47
Second, &c, ...	6·29	8·48	8·74

Due to the more favourable season, butter quality showed some improvement over that of the preceding year, but the results are disappointing. Despite the improved processing equipment installed in factories in recent years there has not been an appreciable increase in the percentage of choice grade butter manufactured. The guaranteed market during the past 15 years for all the butter produced in Australia and the small price margins between different grades have no doubt led to complacency about quality. The real weakness is in the failure of many producers to strive to supply cream of the desired quality. A more determined approach to quality improvement must surely be made by all connected with the industry in order to meet the changing marketing pattern now facing the Australian dairying industry in the disposal of exportable surpluses on overseas markets.

Of the 51 butter factories in the State, 37 are of brick or concrete and conform with desirable structural standards; 13 of the remaining factories still have some useful life ahead; and one factory has reached a stage where closure must take place unless it is completely rebuilt.

Expenditure on factory equipment during the year amounted to £197,000. Features indicative of the trend towards equipping factories with plant which will ensure that processing is efficient and that economies are effected in operating costs are stainless steel piping replacements, the substitution of wooden by metal butter packers, the use of modern roller conveyor systems and cream tipping apparatus to replace manual handling, and straight-through can washers in lieu of rotary machines. Eight factories installed more intensive systems of cream pasteurisation. A notable feature was the first installation in Australia of a new system of cream pasteurisation at the Booval factory. The process is being closely observed and investigations are being carried out by the Division on the system. Only three of these machines are in use anywhere.

THE CHEESE INDUSTRY.

Since the Commonwealth Government subsidies were introduced in 1942, returns to cheese factory suppliers have been equated to those paid to butter factory suppliers. However, during the past two years, when subsidy was not payable on total outputs, values for cheese

have declined in relation to butter prices. This is attributable to about 40 per cent. of Australian cheese production not being covered by the guaranteed price, compared with about 20 per cent. of butter and a greater relative drop in cheese prices than of butter prices since price controls were lifted in Britain in May 1954. The disparity in prices has led to the closure of five small cheese factories. Several other factories are in a precarious position; the diversion of only a couple of suppliers from each would would make their continuance impossible. The difficulties of the cheese industry are unfortunate in view of the substantial improvement of Queensland cheese quality in recent years. This is reflected in Table 2, which shows the results for the past four years and those of 1937-38, the year preceding the steps taken to rehabilitate the cheese industry.

TABLE 2.

CHEESE GRADES.

Quality.	1937–38.	1951–52.	1952–53.	1953–54.	1954–55.
	%	%	%	%	%
First ..	36·80	68·26	86·3	77·68	84·28
Second..	..	30·64	13·2	20·74	14·00
Third ..	63·20 ..	1·10	0·5	1·58	1·72

A survey made co-operatively with the Cheese Marketing Board at the Queensland Industries Fair in April 1955 showed a marked preference among adult consumers for matured cheese. Semi-matured was preferred to mild cheese. Children, however, indicated their preferences to be the reverse of adults.

MARKET MILK AND MILK PRODUCTS.

Due to the favourable seasonal conditions milk pasteurisation factories were comparatively free of problems associated with the maintenance of adequate supplies of raw milk and of milk quality troubles.

Extensions to buildings and plant were made at a number of factories. Generally the factories and equipment were maintained at satisfactory standards and systematic phosphatase tests revealed efficient processing. However, some aspects of treatment in a few factories necessitated official action to ensure more careful observance of hygienic practices.

Close collaboration existed between officers of the Division and of the Brisbane Milk Board in the supervision of farms producing milk for consumption in the metropolitan area.

A pleasing feature was the opening of milk depots at Cunnamulla and Charleville by the Downs Co-operative Dairy Association Ltd. This has ensured the availability of bottled milk in these far Western Queensland towns where there is an adequate local supply. The milk is forwarded from the Toowoomba factory. Other associations are investigating the possibility of establishing depots in central-western and north-western towns.

Free school milk supplies were extended to additional centres, with the result that about 80 per cent. of eligible school children in the State are now included in the scheme.

REGULATIONS UNDER THE DAIRY PRODUCE ACTS.

Some of the regulations under the Dairy Produce Acts which had become outmoded were amended to permit practices which conform with present-day trends in dairy shed practices. Several new regulations were also promulgated.

One amendment provides for all operations and storage of milk and cream to be done in a single building.

Provision was made for electric water boilers of prescribed capacity to be installed at dairy sheds.

It is now specifically required that a means of water storage of a capacity of at least 2,000 gallons must be provided at dairy premises unless the water is piped from a permanent and abundant source such as a well or a bore. Previously there was not a definition of what constituted an ample supply.

A new regulation requires all rubberware used for milking machines to have the trade mark of the manufacturer printed on it.

A cheese factory is now relieved from heating whey returned to farms provided the milk is pasteurised during the cheesemaking process, but the whey tank and piping must be thoroughly cleaned daily.

Another new regulation forbids the sale in pat form of secondary grades of butter. This is designed to ensure that only table quality butter is offered to Queensland consumers.

COMMONWEALTH DAIRY INDUSTRY EXTENSION GRANT.

Small-scale demonstrations with emphasis on pasture improvement and management and fodder conservation were continued on the properties of co-operating farmers in all dairying districts. The farms are selected after consultation with local branches of the Queensland Dairymen's Organisation. An additional 42 demonstrations were commenced, making a total of 124 in progress during the year.

Eighteen well-attended field days were conducted, as well as a most successful organised tour of farms in the Toowoomba district, which was attended by over 450 people. The interest in better practices stimulated by the demonstrations has been most gratifying.

A detailed survey of various aspects of dairying practices on Queensland farms has been completed and will shortly be published. Valuable factual data not hitherto available are provided by this survey.

Special displays were prepared and exhibited at agricultural shows. An extensive collection of coloured transparencies and black and white prints is being built up. These have been widely used by officers for extension work at meetings of farmers' organisations and for discussions with individual farmers.

HERD PRODUCTION RECORDING.

Pure Bred Recording Scheme.

A slight decrease took place in the numbers of stud herds recorded under the Pure Bred Dairy Cattle Production Recording Scheme, there being 134 herds submitted as against 145 in 1953-54. The average production per cow was 602 gallons of milk and 288 lb. butterfat. The total number of cows which qualified for entry into the advanced register was 781, or 51·6 per cent. of cows tested.

Amendments to the rules to become effective on 1st July, 1955 provide for the proportion of cows in the herds to be progressively increased over a period of three years until all cows must be recorded. Slight changes have also been made in the production standards and the official lactation period has been increased from 273 to 300 days to conform with the rules in most other countries.

Group Herd Recording Scheme.

In response to requests from farmers, 10 new herd recording groups were formed, bringing the total to 65. There were about 48,000 cows being production-recorded during the year. Lactations for the recording year ended 30th September, 1954 were completed by 41,378 cows. Their average yield was 314 gallons milk containing 134 lb. butterfat; the average lactation period was 210 days. The decline of 16 lb. butterfat per cow compared with the previous year was attributable to a comparatively large number of cows recorded for the first time and the unfavourable seasonal conditions existing between March and July, 1954. The results emphasise the usual lack of sufficient provision for conserving fodder on Queensland dairy farms.

Surveys on various aspects of data which are being accumulated from the herd production recording scheme have been continued.

A study of all data collected between the inception of the group scheme in 1948 and 1954 has indicated that in most dairying districts cows which calve in the third quarter of the year (July to September) produce more in the ensuing lactation than cows which calve in other seasons. Calving in the January to March quarter should in particular be avoided, as the average production of such cows is lower than those which freshen during any other quarter of the year. An advisory article on the subject was published.

The loss of production which occurs from the relatively short lactation periods of a high proportion of cows has also been demonstrated by another survey.

A comparison was made between the estimated production from herd recording data and the actual butterfat credited from produce supplied to factories. This investigation, based on figures from 508 farms, revealed that 92 per cent. of the estimated quantity of butterfat was supplied to factories. The difference would be accounted for by (*a*) separation and spillage losses, (*b*) milk used for calf rearing and domestic purposes on the farms, and (*c*) the estimated production being calculated from milk weights and butterfat tests made on only one day each month.

A survey of milking times and practices was made on 1,070 farms. On 88 (8·2 per cent.), hand-milking was employed, and on 982 (91·8 per cent.), the cows were milked by machine. The average milking rate per hour per person was 6·5 cows by hand-milking and 12·6 cows by machine-milking. The range on machine-milking farms was from 4 to 46. On one-third of the farms using milking machines, hand-stripping of cows has been abandoned. The results indicated that marked variations in milking rates exist, due mainly to the degree of efficiency of the use of labour, training of herds and the mechanical condition of the milking machine. It was evident that on a high proportion of farms the teatcups are allowed to remain too long on the cows. This not only prolongs the milking time, but tends to make cows slow milkers and by causing injury to the delicate teat lining may predispose them to mastitis infection.

Two new features incorporated in the herd recording scheme were sire surveying and calf marking. Both will aid in further strengthening the information made available from production recording to assist Queensland dairy farmers in herd improvement work.

FARM ACTIVITIES.

Despite the difficulty which still exists in obtaining galvanised iron, many new dairy sheds were erected and existing buildings renovated. A determined effort being made by officers to bring premises up to reasonable compliance with the requirements of the Dairy Produce Acts is having the desired result. Emphasis is being placed on the provision of an adequate water supply, means of ensuring ample hot water, wash-up troughs, utensils draining rack and milk or cream cooler.

A system of cleaning milking machines by recirculation of the cleanser and hot water is creating keen interest following the manufacture by several firms of the necessary accessories for fitting to machines. The acid-alkali type of cleansers which are also now available are proving more popular than other cleansers for milking machines. A pilot survey of the mechanical condition of milking machines in 10 districts revealed that many machines are not operating at full efficiency. The advisory help given by field officers on mechanical aspects of milking machines and separators is much appreciated by farmers.

Good hygienic practices are fundamental to producing high quality milk and cream, but the preservation of that quality until they reach the factory is also essential. This necessitates protecting them from exposure to high temperatures, and a concerted effort is being made to have some means of cooling placed on farms. Over 1,000 farm refrigerators are now installed and alternative means of cooling are also being provided in increasing numbers.

Plate 1.—The Type of Dairy Building at Which the Department is Aiming Throughout the State.

Plate 2.—Dairy Farmers Examine Improved Pasture at a Field Day.

Plate 3.—Strip Grazing in Action on a Dairy Demonstration Plot.

Plate 4.—Liquid Milk Storage Vats in a Modern Milk Factory.

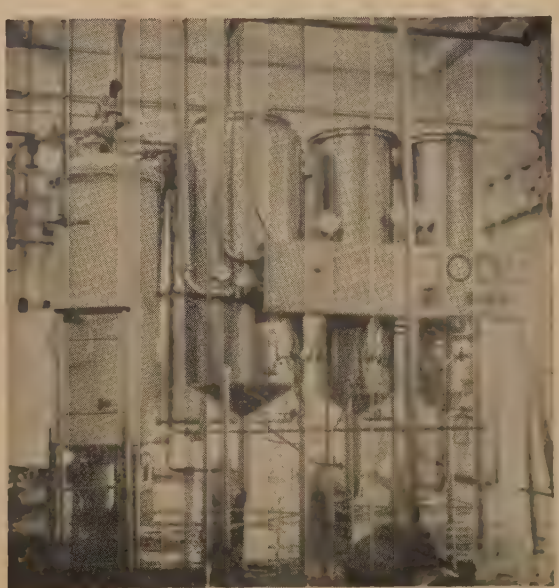


Plate 5.—Cream Treatment Unit in a Butter Factory.

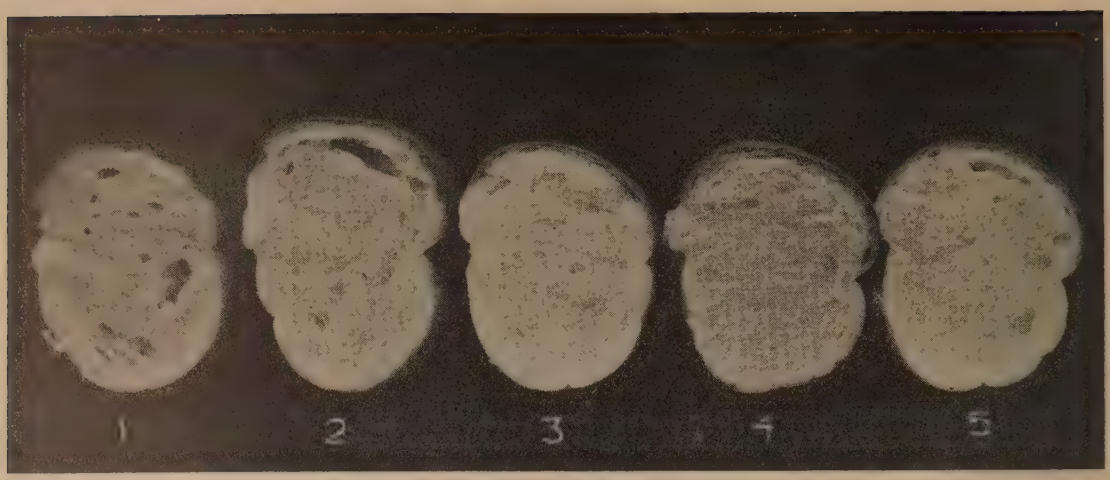
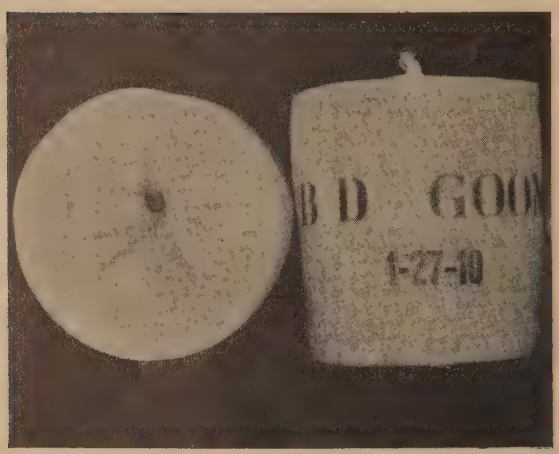


Plate 6.—Comparison of Water-loaf and Milk-loaf Bread. Note the open texture in the water-loaf (1 and 2) and the improved texture in skim-milk and buttermilk powder loaves (3, 4 and 5).



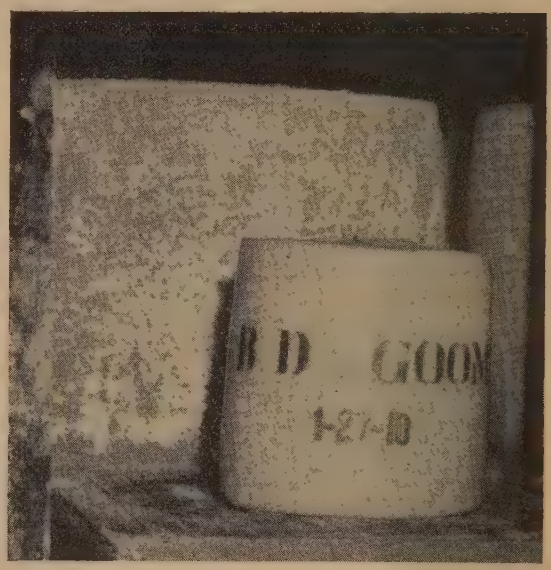


Plate 7.—Right, Loaf Cheese Packaged Under Vacuum in Polythene Plastic Bags. Same Cheese Six Months Later After Storage with Untreated Cheese.

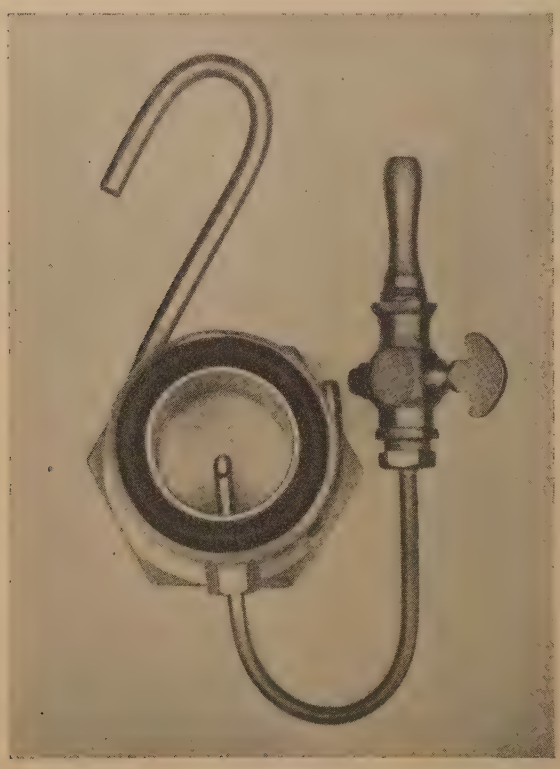


Plate 8.—Sampling Device Used for In-line Sampling of Cheese-milk.

Plate 9.—Suitability of Rubberware of Various Composition. From left, Used synthetic rubber; used natural rubber; unused inflation.

During the year steps were taken to strengthen the methods being used for extension work by placing greater reliance on group and similar methods, although the individual contact method must continue to play a major part in advisory activities. At group meetings of various kinds, coloured slides were used to assist the talks, and method demonstrations created favourable interest. Radio talks, press releases, displays at agricultural shows, and journal articles were also freely used. A wall sheet illustrating recommended dairy shed practices was prepared and when printed will be supplied to every dairy farmer in the State for placing in the dairy shed.

RESEARCH AND LABORATORY SERVICES.

Investigations.

Milk.—Further investigations were made on the reconstitution of milk, the trials including the addition to the basic materials (skim-milk powder and butterfat) of buttermilk powder, ascorbic acid, calcium lactate and sodium chloride. A palatable product was produced in each case, but the additives did not confer any superiority in flavour. Reconstituted milk would appear to offer much promise for use in countries where local milk supplies are deficient.

The use of 2 per cent. of high-heat-treated buttermilk powder in bread dough was shown to give bread of good crust, colour, flavour and keeping quality. It would also appear that its addition would only slightly increase the cost of manufacture of bread.

Studies on methods of avoiding a seasonal decline in the solids-not-fat content of milk have been continued. It is apparent that the cause is often associated with inadequate nutrition. Trials with various rations have so far failed to bring about an increase in the solids-not-fat, although a significant increase in the fat percentage occurred on farms where long roughage was fed.

Cheese.—Seasonal changes in the composition of milk and their effect on the yield of cheese are being investigated. Initially, attention was devoted to a method of accurate sampling of the bulk milk at a factory and a line sampling device was designed. Although the work is still in the developmental stage, the results indicate that marked variations sometimes occur in other constituents of milk while only minor fluctuations are noted in its fat content. The work gives promise of throwing light on important aspects of milk quality in relation to cheese yield.

Packaging of retail size (½ lb. and 1 lb.) pieces of cheese in a plastic covering has been shown to offer a means of presenting cheese which should have better consumer appeal, as well as minimising shrinkage loss. Several factories are interested in marketing cheese so packed and it can be expected that there will be a distinct trend within a few years to selling plastic-wrapped cheese.

Further work was carried out on methods of shortening the time occupied in cheddar cheese-making. Fifteen vats were made in three factories. It is obvious that more work on the process is necessary before factories will change over from the conventional process.

The benefit to the quality of the resultant cheese was demonstrated in trials with the use of cooled milk. Significant differences in grade points were scored by the experimental cheeses over the controls made from uncooled milk.

Butter.—Investigations on the relationship between the intensity of pasteurisation of cream and the flavour score of butter were continued, including trials of an entirely new type of pasteuriser installed in one factory. Steam consumption, fat losses and other aspects of cream treatment are also being studied.

Experimental churnings of butter made from creams differing in pH value but otherwise the same have shown that butter with pH approaching 8.0 has superior keeping quality in cold storage over butters the pH of which varies from 6·8 to 7·5. The work is being extended to determine the influence of pH on butterfat losses during manufacture and on the quality of buttermilk powder. This latter aspect is important because of the many factories which now have buttermilk drying plant.

Laboratory Control Services.

A summary of the samples submitted to routine laboratory tests is given below:

Milk:	
Plate counts for bacteria	1,698
Coliform tests	2,863
Phosphatase test	1,567
Pasteurised milk fat tests	1,654
Microscopic examinations	9,342
Warm milk	650
Butter:	
Chemical analysis	1,678
pH	891
Microscopic test for structure	1,678
Bacteriological examination	1,678
Cheese:	
Starter cultures distributed	649
Other:	
Miscellaneous samples	2,028
Dairy glassware tested	12,916 pieces.

STAFF.

The Director of the Field Services Branch (Mr. R. A. Paul) resigned in July 1954 and was replaced by Mr. F. C. Coleman. Five other permanent officers resigned and five new officers were appointed. Replacements of officers of graduate status have not been possible due to inability to recruit such staff. The staff have generally performed their duties with zeal and efficiency.

DIVISION OF MARKETING.

Director of Marketing—Mr. H. S. Hunter.

The open market now is the established order overseas, with supplies of agricultural products adequate, or in some instances more than adequate to meet demands. The consumer, with the necessity for rationing removed, exercises his right of choice. In this situation quality and price of products become matters of prime concern, and exporting countries not only have to get back to the old way of doing business, but must also adopt up-to-date methods of production and marketing.

In the past year marketing difficulties have been accentuated by the gradual channelling into consumption of large Government-held stocks of meat, dairy and egg products and other foodstuffs which had been maintained as emergency reserves in the United Kingdom and U.S.A., or which like wheat accumulated as the result of deliberate stimulation of production to overcome the post-war grain shortage.

World market price trends are indicated by past seasons' realisations as shown in the report of the Marketing Branch. For example, wool prices showed a decline of approximately 13 per cent. on the previous season's values. Sugar prices under the U.K. contract at £40 15s. stg. per ton c.i.f. for the 1955 season were at a reduction of 5s. stg. per ton on the previous season's prices. In the last year of the contract for butter and cheese the negotiated prices were reduced by 3¾ per cent. and 7½ per cent. (the maximum permitted under the contract) respectively over those of the previous year. Eggs and egg pulp prices fell approximately 5 per cent. and 27 per cent. respectively.

The Commonwealth Government is making payments to meat exporters in anticipation that under the terms of the meat contract deficiency payments will be payable this year by the U.K. Government.

Free wheat prices have not fallen below the level of the minimum price fixed under the International Wheat Agreement, but this is due to the fact that the exporting countries are organised to hold large stocks. It seems unlikely that Australia will have reduced last year's carryover of 94 million bushels at the end of the cereal year on 31st November. Queensland's carryover, it is estimated, will show an increase from 2·9 million bushels to over 4 million bushels. The Queensland surplus may be reduced if shipping and land transport can be arranged, as the wheat is of a quality for which there is a current demand.

The downward trend of commodity prices on the world's markets has serious implications for Australia with its continuously rising level of production costs.

OVERSEAS VISITS.

As mentioned in last year's Report of the Division of Marketing, 19 agricultural commodity boards operating in Queensland, including two non-marketing organisations, responded to the invitation of the Council of Agriculture to subscribe funds for the purpose of sending a marketing officer overseas in order that the Division of Marketing might be fully informed on the developments in other countries in marketing techniques and in agricultural organisation and co-operation. The funds subscribed by the Council's constituent bodies were supplemented by a grant from the Commonwealth Bank of Australia and the Queensland Government agreed to make my services available for the purpose.

My visit to the United Kingdom, Australia's main overseas market, which took place towards the end of 1954, was timely in that it coincided with a time of transition when rationing schemes had been terminated and bulk contracts by Governments were giving place to merchant-to-merchant trading. Visits were made there to merchant houses, Government Departments and producers' organisations. The operation of primary producers' co-operatives and of consumer's co-operatives was examined at first hand on the Continent and in North America. In Canada and the United States special attention was given to modern trends in the location and design of wholesale markets for fruit and vegetables. The marketing of tobacco leaf was studied and attention was given to other primary products, including the bulk handling of grains and modern methods for the retailing of foodstuffs.

Some time was spent with the Canadian Department of Agriculture, with the United States Department of Agriculture in Washington, and with Land Grant Colleges attached to certain of the American Universities, notably California, Ohio and North Carolina. Many improved marketing methods within the functions of harvesting, packaging, transporting, wholesaleing and retailing have followed research conducted by the Agricultural Marketing Service of the United States Department of Agriculture through the University Colleges of Agriculture. As research projects usually are helped with grants of money from the industries concerned there is surprisingly little time lag in putting new marketing practices into commercial operation.

The opportunity was provided whilst in Europe of visiting the headquarters of the United Nations Food and Agriculture Organisation and discussing its activities with senior officers of the Organisation. In Africa, the

Plate 1.—The Butter Marketing Board's New Premises at Hamilton, Brisbane.

Plate 2.—New Tobacco Leaf Auction Premises of the South Queensland Tobacco Growers' Co-operative Association Ltd., at Northgate, Brisbane.

Plate 3.—Baled Tobacco Leaf Set Out for Inspection on the Northgate Floor.

marketing methods employed by the Rhodesian Tobacco Growers' Association were examined and an assessment was made of the developing pineapple growing and canning industry in South Africa.

A most pleasing feature of my trip was the enthusiastic co-operation and practical help which was given me in all countries visited, by Departments of Agriculture, Universities, marketing organisations, growers' co-operatives and Australia's own representatives abroad. During my absence the Division came under the direction of Mr. C. H. Defries, Assistant Director of Marketing.

During the year the Butter Marketing Board made its Brisbane Manager (Mr. G. W. Coombs) available to join an Australian Trade Mission which visited South-east Asian countries. The Mission, which was organised by the Commonwealth Department of Commerce and Agriculture, was composed of representatives of the Trade Promotion Section of that Department, of trading banks, and of export trading interests. There are already indications that the trade in those areas will be widened for Queensland dairy products as a result of the work of Mr. Coombs with this Mission. A new outlet for Queensland butter has been opened in Bangkok, proposals are under consideration to supply powdered milks for a recombined milk scheme to help overcome a milk shortage throughout South-east Asia, and the merits of Queensland butter concentrate were brought to the notice of prospective buyers in the East. Butter concentrate, after successfully passing a two years' test, has been taken up by the British Armed Services and contracts have been entered into with the Butter Marketing Board to supply 100 to 150 tons a year. Mr. Coombs played a prominent part, in conjunction with C.S.I.R.O., in the development of the product known as butter concentrate. A new building has just been completed at Hamilton for the Board containing a modern factory, laboratories, cool stores and administrative offices.

Plate 4.—Canning Butter Concentrate at the Butter Marketing Board's Factory.

GRAINS.

The changes which have occurred in the international marketing situation have in themselves created new handling problems, but in the case of Queensland's winter grain crops, wheat and barley, these problems have been further accentuated by expanding production. The wheat and barley crops combined have averaged 16 million bushels for the last three years compared with 9½ million for the previous three years ended 1951-52. On present indications, with this year's wheat and barley crops and wheat carryover, storage and transport will have to be provided for more than 23 million bushels of winter grains during the coming year. The summer grain harvests, being smaller and coming, as they do, at a different time of the year, have not as yet presented such a big problem.

The State Wheat Board's bulk handling programme, coupled with further emergency bag storage, should cover the handling and storage position. However, the transport of grain from country centres to Brisbane, the main consumption and shipping centre, still remains a problem and the development of bulk handling will not in itself contribute to its solution.

TOBACCO.

The feature of the tobacco industry which has attracted most public attention during the year has been the high average level of prices and clearances at the 1955 auction series. Some 2,677,853 lb. of leaf sold from the 1955 series to 30th June realised an average price of 172d. per lb., compared with an average of 133d. per lb. realised on the whole of the 1954 auction series, whilst clearances this year have averaged 96·7 per cent., compared with 90·4 per cent. for the whole of last year.

Two large overseas companies which are extending their manufacturing activities to Australia have entered the market for Queensland tobacco leaf.

Considerable attention has been paid to the grading and presentation of leaf with the object of achieving uniformity from the farm right through to the factory. Representatives of The Tobacco Leaf Marketing Board, the manufacturers and the production and marketing divisions of the Department have been co-operating in this work and substantial progress has been achieved. Schools have been held at which growers have been given practical advice on leaf quality and grading; the Tobacco Leaf Marketing Board, in co-operation with manufacturers, is investigating the setting up of standard grades to meet the requirements of all parties; and attention has been given to the presentation of leaf on the auction floor. A new tobacco storage and auction floor erected at Northgate during the year by the South Queensland Tobacco Growers' Co-operative Association Limited provides ideal conditions for the display and sale of leaf.

LEGISLATION.

During the year, in concert with the other States, an Act was passed by the Queensland Parliament re-establishing for five years up to and including the 1957-58 wheat crop the stabilisation provisions in the wheat marketing legislation. The Act, styled *The Wheat Industry Stabilisation Act of* 1954, repeals *The Wheat Marketing Act* passed in 1953, extends the authority of the Australian Wheat Board to market Queensland wheat up to and including the 1957-58 crop, and is complementary to the Commonwealth *Wheat Industry Stabilisation Act,* 1954, and the *Wheat Export Charge Act,* 1954.

The Primary Producers' Organisation and Marketing Acts were amended to simplify the procedure for the winding-up of boards; to provide for the auditing of the books and accounts of the constituent bodies of the Sugar Cane Growers' Council; to meet the needs of the Council of Agriculture; and in other minor respects.

COUNCIL OF AGRICULTURE.

The Council of Agriculture, with Mr. B. Foley as Chairman of its Executive Committee, has completed a year of worthy achievement in its work on behalf of its constituent boards and of rural producers generally. The Secretary (Mr. J. A. Jones) has teamed with other advocates in representing the interests of rural producers before the Industrial Court and before the Tariff Board in a number of hearings. His services have also been availed of to assist boards in their administrative difficulties. There is an harmonious and co-operative relationship between the Council and the boards and between the Council and the Department of Agriculture and Stock which should be helpful to the rural industries in any difficult time that may be ahead.

AGRICULTURAL STANDARDS.

In its regulatory work under the *Agricultural Standards Act,* the Division is meeting with a gratifying measure of co-operation from merchants dealing in seeds and other requisites of the man on the land. There is a more extensive use by merchants of efficient seed cleaning machinery, and the facilities of the seed testing station have been strained at times because of the number of samples submitted by merchants for checking. These totalled 4,643, and in addition samples representing grain for export numbered 1,041, compared with 727 in the previous year.

Under the Seed Certification Scheme, 8,153 bushels of hybrid maize qualified in 1954, compared with 3,584 in 1952. Grain sorghum certification increased from 4,871 bus. to 14,831 bus. in the same 2-year period. The Bean Seed Certification Scheme has been restricted to the production of certified mother seed for sale to commercial seed producers.

OBITUARY.

It is with deep regret that a record is made of the death of Mr. D. G. O'Shea of Southbrook. The late Mr. O'Shea served as a member of The Cheese Marketing Board for a period of 26 years up to 31st December, 1950. During that time he was Chairman of the Board for 15 years. He was a member of the Council of Agriculture for 10 years. It is also with deep regret that the death is recorded of Mr. D. L. Cowie, who served over 11 years up to the time of his death as a member of The Atherton Tableland Maize Marketing Board.

REPORTS OF BRANCHES.

AGRICULTURE BRANCH.

Mr. W. J. S. Sloan, Director of Agriculture.

Seldom has the agricultural picture at this time of the year looked so bright for winter and spring production. All agricultural districts in the State entered the winter months with large supplies of moisture in the soil and ample surface and sub-surface water to meet requirements for stock and irrigation.

Rain adversely affected the harvest of the 1954 wheat crop, which otherwise might have given a record yield. Harvesting of the summer crops was also lowered appreciably. Counterbalancing these losses was the excellence of the season for pastures and grazing crops. Pastures made abundant growth throughout the State.

The trend in emphasis from expansion in production to cost of production noted last year has developed even more strongly. As a result, a drop in the 1955 acreage sown to wheat is anticipated. On the other hand, an increase in linseed acreage may occur because there is a guaranteed price for this crop.

The production of tobacco and cotton still falls far short of home market requirements. There is scope for expansion of these crops. The irrigation schemes being developed in the Lower Burdekin and on the Barron River should boost the output of both tobacco and cotton.

Tobacco growers have had a very satisfactory year. The crops, although badly affected by field mould in the early stages, subsequently made a surprisingly good recovery to return fair yields of good quality leaf. The high prices received outweighed the losses due to disease and there is litle doubt that for the tobacco grower 1955 is the best year on record. Shortage of technical staff has impeded the development of experimental work on tobacco for a number of years. With the appointment of Mr. F. Chippendale as Senior Agronomist to plan and supervise work on the Tobacco Experiment Stations being developed at Parada and Inglewood and to be similarly associated with tobacco work on the new experiment station at Milleroo on the Lower Burdekin, the position has been much improved.

The acreage sown to general agricultural crops in the State has shown considerable expansion over the last 10 years for which statistics are available. In the season 1944-45 there were 1,412,000 acres under general agricultural crops out of a total of 1,797,000 acres under cultivation in Queensland; in 1953-54 there were 1,827,000 acres out of a total of 2,358,127 acres, representing in each case an increase of approximately 30 per cent. in 10 years. This is equivalent to an average annual increase of 56,000 acres under cultivation, of which 41,500 acres are devoted to general agricultural crops.

Accurate figures for acreage under improved pastures have only been available in recent years, the total recorded in 1953-54 being 1,840,000 acres. With the opening up of new lands and the falling of scrub and forest, the acreage of improved pastures is being steadily increased. Irrigation is playing a small but highly significant part also in this direction. Furthermore, there is a widespread practical desire by stock-owners throughout Queensland to improve native pastures (of which there are many millions of acres) by introducing new species, prominent among them being buffel grass and green panic grass.

These developments in agriculture and in pasture lands in Queensland are highly gratifying. But they have placed a heavy burden on the advisory services over a period when recruitment of suitable technical staff has been most difficult. As a partial solution to the problem of meeting more effectively the demand for advisory services, special training in extension methods has been given to selected field officers. For this purpose 10 officers participated in a school which was conducted in October, 1954. It is anticipated that a further group of officers will receive training at a smiliar school in the coming year.

Well illustrated up-to-date articles on various phases of crop and pasture production constitute an essential part of good advisory services. To assist in their preparation, a country agronomist has been transferred to Brisbane.

The output of an ever-widening range of implements by machinery manufacturers is one of the noteworthy achievements in the agricultural field in the post-war period. Recent years have seen the appearance in many districts of such modern machines as forage harvesters, improved grain harvesters, hay balers, sod seeders, chisel ploughs, buckrakes, farm dozers, bulk-handling machinery for grain, and so on. This upsurge of new machines is certain to have a profound influence on future agricultural practices.

Dr. L. G. Miles (Assistant Director of Agriculture) represented Queensland at the Second Congress of the Pan-Indian Ocean Science Association held at Perth in August, 1954. He presented papers on dry farming methods in Queensland and on tropical crops and pastures. The Senior Agrostologist (Mr. S. Marriott) visited Western Australia and the Northern Territory in March and April, 1955, for the purpose of studying buffel grass pastures. His contacts and observations should be very useful in planning further work on buffel grass pastures in Queensland.

FIELD CROPS.

The year under review has been one of above-average rainfall in almost all agricultural districts of Queensland. However, while some districts have received almost twice their annual average, the season has not been ideal for the production of annual crops.

This has been due mainly to: (1) continuous rains interfering with the preparation of land and the harvesting of crops; (2) the waterlogging of growing crops; (3) the actual destruction of crops by flood waters or cyclonic winds; and (4) the generally hot, dry midsummer. Overall, the inland districts have had a bountiful season, while districts nearer the coast have suffered from excessive rain.

The winter season of 1954 opened dry, with poor prospects for winter cropping. July was marked by cyclonic flood rains in south-eastern Queensland, which ensured a good (if somewhat late) winter season. The remainder of the winter was mild, with good follow-up rains in August which encouraged lush growth of grain and fodder crops. Most of the agricultural districts continued to receive above-average falls during the spring months. This period was spoiled, however, by the prevalence of thunderstorms during October and November, which destroyed some thousands of acres of wheat and lowered yield and quality of most winter crops.

The year was marred for summer crops because the summer quarter was the period of lowest rainfall in the whole 12 months. Thus conditions were unfavourable for the South Burnett peanut crop and for early-planted maize and sorghums. Useful rains fell in South Queensland in late January and February, but this rain was too late for a heavy main planting of summer crops. On the Atherton Tableland, the main wet season was much later than usual, delaying maize and peanut planting until well into January.

The autumn was one of cyclonic rains which caused heavy and prolonged flooding of lowlying lands. Cropping came to a standstill in many areas, but pastures and

established crops on well-drained land flourished. The winter of 1955 was entered with good stocks of stored hay in many districts and with soils well supplied with moisture for winter crops.

An important exception to the general seasonal pattern was a sector of the southern Darling Downs, which missed rains frequently when areas east, west and north were receiving a good soaking. However, this area, after having experienced a mediocre winter-spring and a droughty summer, finally received good relief rain in the autumn.

Wheat.

As in 1950 and 1952, last year's wheat season was affected by excessive rainfall in most wheat districts, the important exception being that noted in the preceding section. Planting was delayed until after the cyclonic rains of mid-July. The season continued favourable, so crops made lush growth during the spring, while their vivid green colour indicated adequate nitrogen availability. However, the spring storms were accompanied by losses due to hail, waterlogging, and rust and other diseases, which seriously reduced the yield potential. As it was, the ultimate yield exceeded 15 million bushels, placing the crop second only to that of 1952 in total grain produced.

While weathering accounted for considerable loss in appearance and in bushel weight, bread-making quality was well maintained by the prevalence of high-gluten-quality varieties, notably Spica. Considerable pinching of grain resulted from waterlogging and also from rust attack.

During its third year of general distribution, the Queensland-bred Spica attained the position of premier variety, occupying an area of 120,550 acres, or 17.5 per cent. of the State acreage. At harvest time it was subjected to some serious criticism because of the difficulty encountered in threshing the grain. It is well to remember, however, that this very toughness of its heads confers real benefits during a wet end-season. Principal among these are its resistance to shattering and its comparative protection from weathering. In addition, the variety is highly resistant to stem-rust. Other principal varieties in order of importance were Gabo, Charter, Lawrence, Celebration, Seafoam and Puora.

The plant breeding programme has provided a series of rust-resistant selections which are undergoing field tests for yield and quality. The existence of facilities within the Department for the testing of milling and baking qualities should enable a quicker assessment of quality to be made than has been possible hitherto. Progress is also being made with the purification of rust-resistant lines evolved from standard varieties by the back-cross breeding method. Within Puora, for example, lines have now been derived with resistances to stem-rust, leaf-rust and mildew; crosses have been made to combine these three resistances within the one Puora line.

The year 1955 sees the first major release to the Wheat Board of a purified varietal stock intended to replace older contaminated stocks. The first such release is of Spica, to be followed at yearly intervals by Gabo and other leading varieties.

While the 1955 season has opened most favourably, it is probable that a decline in wheat acreage will occur, and increased interest is being shown in alternative crops and in the introduction of some form of animal production on grain farms. One good feature of the present economic trend is that attention is being focussed as never before on the improvement of protein content of the wheat grain, this aspect being of the utmost importance when profitable export markets are being sought.

Maize.

Production throughout South Queensland has been subjected to two main hazards this season: (1) hot dry midsummer conditions during the flowering period of early-planted crops, and (2) excessively wet conditions during the maturation and harvesting period. On the Atherton Tableland, general planting was late, and growth was retarded by continuously wet weather following planting. Yields therefore will generally be below average.

Many crops on alluvial country have been entirely lost through flooding, and losses in yield and quality have been incurred elsewhere through cob-rots and insect damage. Coastal plantings in particular have suffered severely.

During the 1953-54 season the Department instituted a series of hybrid maize varietal trials, supplementing those arranged by the Queensland Agricultural High School and College, and covering all maize districts from south to north. The main features of the results were:—

(1) In all districts other than the Atherton Tableland, one or more of the "Q" hybrids tested proved markedly superior to the best open-pollinated varieties that could be provided for comparison.

(2) In general the Grafton (GH) hybrids also proved high-yielding and adaptable. This is not surprising, as these hybrids are based upon Queensland pedigree lines.

(3) The DS and NEH hybrids (developed in the New England district of New South Wales) performed well only on the southern Darling Downs.

(4) Under the special conditions of the Atherton Tableland no hybrid so far tested has shown promise of superiority over the locally adapted variety. In the drier climate of Mareeba, only 20 miles to the north of Atherton, Q and GH hybrids gave yield increases over local varieties which were as clear-cut as anywhere else in the State.

The results of this programme, combined with those of previous years, have been used in the compilation of an extension article which incorporates a table of recommendations for all districts of the State.

Sorghum and Sudan Grass.

These crops suffered from much the same seasonal disabilities as maize, though flood damage was not so serious a factor. The absence of good midsummer rains meant a delay in the main-crop planting, with the result that such crops were subjected to hazards of midge damage and early frosts.

The impact of certified seed has been most noticeable in this crop, particularly in districts of certified seed production, such as the Darling Downs, South Burnett and Callide and Dawson Valleys. Certification is a service which makes great demands upon the time of Departmental officers, but it is one which is highly appreciated by sorghum growers. The need for intensified certified seed production in sweet sorghum has been highlighted by the demands of northern and western graziers for reliable seed for crops intended for ensilage.

The dual-purpose value of grain sorghum has made it a most useful crop in districts of new agricultural development, such as the Wandoan–Taroom and Central Highlands areas. This value is accentuated, especially in Central Queensland, by the ratooning capacity of the crop. This characteristic has enabled many farmers to obtain two grain crops plus one or two seasons of grazing from the one initial planting.

The breeding programme at Kingaroy, coupled with the introduction of new material from other countries, has provided a large range of new fixed selections which now require testing against established varieties. The most interesting of the recent introductions is Nunaba, a midge-resistant variety from West Africa, which has just undergone a quarantine planting. Should this variety prove resistant under Queensland conditions, its use in crosses with local dwarf varieties will constitute the most important breeding project yet undertaken with this crop.

Sweet Sudan grass is in heavy demand as a grazing crop, and this year's production of certified seed should meet a ready sale. Work is proceeding in the purification of Tift Sudan grass, a new variety which is characterised by heavy production and a high degree of resistance to leaf diseases.

Oats.

The wet conditions of the 1954 winter and the 1955 autumn have further emphasised the importance of crown-rust resistance in grazing oats. Observations in the past year have also verified the fact that a new

form of crown-rust capable of attacking Victand (and allied varieties, including Acacia) is now prevalent. Under these conditions the new Departmental release, Bovah, has given a splendid performance; an American introduction, Benton, is showing similar promise this season. The relative performances of Bovah and certain other varieties during 1954 season are summarised in Table 1.

TABLE 1.

PRODUCTION IN TERMS OF COW GRAZING HOURS PER ACRE OF SELECTED OAT VARIETIES IN TWO GRAZING TRIALS, 1954 SEASON.

Variety.	Gympie.	Moggill.	Average.
Bovah	451	634	543
BVH—4982 ..	451	571	511
Klein	423	..	..
Garry	373	..	..
Algerian	341	618	479
Victand	288	346	317

Oil Crops.

Linseed is in process of rehabilitation after a season (1953) in which it almost disappeared from the agricultural scene. The offer of a guaranteed price of over £70 per ton for linseed at a time when grain prices have seriously weakened greatly enhances the status of this crop as a competitor with wheat. While the paucity of April-May rains in 1954 was responsible for planting being restricted to some 18,000 acres, a record acreage could well be sown in 1955.

Exploratory plots of safflower were established, in collaboration with C.S.I.R.O., at a number of sites in Queensland last year. The crop excited considerable interest, and in some areas provided very profitable yields. Present advice suggests that there is only a limited market for this crop. Certain drawbacks in relation to aphid control and harvesting difficulties still require to be overcome, but the crop has shown promise.

Tobacco.

The season was unfavourable for high tobacco yields. This was largely due to continued wet conditions in spring and early summer which encouraged the development of blue mould. In addition, some hail damage to crops in the south-western tobacco growing area was reported.

In spite of these conditions, good quality leaf was produced, and record prices (up to 240d. per pound) were realised at Mareeba sales. The first Brisbane sale was also successful, an average price of 160d. per pound being paid. At all 1955 sales to date a clearance of over 95 per cent. of the leaf submitted has been made.

Grading schools were arranged by the Department in consultation with representatives of the manufacturers and growers' organisations. These were held in North Queensland in January, and in south-western Queensland in April. At these schools, manufacturers' representatives outlined correct methods of grading and baling tobacco leaf. Considerable interest was shown by the growers and attendances were good. Representatives of the industry agreed that the grading and presentation of leaf on the display floors in 1955 indicated that the schools had been of considerable assistance to growers.

Hicks retained its position as the most popular variety, followed in order by Virginia Gold and Gold Dollar. Pure seed production continued to be a major service provided by the Department for growers. Seed sold last year totalled 1,579 oz., representing some 10 varieties.

Cotton.

Final figures for the 1953-54 season indicated that the average yield was 460 lb. of seed cotton per acre.

Seed for an increased planting of 23,000 acres was supplied in the 1954-55 season. However, owing to the protracted heavy rains of the autumn months, the harvested area will be well below this figure. Flood losses were heavy in the Theodore district for the second year in succession. Insect damage was also more serious than normal, and lint quality was reduced by the wet weather.

A significant development in the industry was the purchase by two cotton growers of their own mechanical pickers. Previously all such harvesters were owned and operated by the Cotton Marketing Board. This is an indication of improving stability in an industry which has been rehabilitating itself steadily with the aid of a reasonable guaranteed price during recent years.

There has been a great improvement in ginning percentage of cotton over the past 30 years. The big change which was evident about 1933 was the result of replacing old varieties with current varieties such as Miller, New Mexico Acala and Triumph. The improvement since then has been due to breeding work within these varieties, and principally to the development of Miller, 43-9-0, which has a high ginning percentage.

Cowpeas.

While Poona remains the most widely grown cowpea on soils which are free from the stem-rot organism, its susceptibility to this disease renders it totally unsuitable for many areas of southern Queensland. Of the commercially grown varieties, Cristaudo and Giant are the only two which show a high degree of field resistance to this disease.

The new Queensland variety, Soutter, combines excellent productivity and vegetative cover with partial resistance to stem-rot. Unfortunately, three new introductions which appear to be immune to the disease are not good agronomic varieties, and attempts to cross them with Soutter have so far been unsuccessful.

Peanuts.

From a sown area approaching 38,000 acres a yield of 17,000 tons is anticipated. Plantings in the main peanut district, the South Burnett, were made in good time, and harvesting of some crops was well under way before the heavy rains occurred in late March. Further periods of wet weather interfered with the main harvest, and some crops were lost due to mould and germination of the nuts in the field.

The late commencement of the wet season in North Queensland delayed planting till late January, and crops were backward. The heavy autumn rains favoured weed growth and hindered cultivation, with the result that yield prospects are not good.

The trend towards mechanical harvesting gained further momentum in spite of the unfavourable harvest weather. This process involves drying of the nuts in windrows instead of in hand-made stooks, and pick-up harvesting from these rows. The wet autumn made it most difficult to sun-dry nuts effectively, and the desirability of pulling and threshing nuts in one continuous operation became evident. Such a process would necessitate artificial drying of the harvested nuts. Drying equipment for this purpose was recently demonstrated by a machinery firm.

Potatoes.

Seasonal conditions in the main potato growing areas (the Lockyer, Fassifern and Brisbane districts) were favourable for the spring crop. The autumn planting was delayed by summer drought, and the crop suffered serious losses from flood rains during the growing period. The wet autumn delayed harvesting, particularly in the heavier soils, and yields are expected to be well below average.

Sebago is now the most popular variety in the State, comprising about 70 per cent. of the total plantings; Exton is next, approximating 20 per cent. of the total area. Sebago is favoured because of its high yielding capacity, its good size and shape, its relative freedom from scab, and the ready availability of seed.

At the Irrigation Research Station, Gatton, an experiment was laid down to determine whether close spacing of Sebago plants (4-6 in. instead of the usual 15 in.) would result in the production of seed potatoes of a size suitable for single sets. There was, however, little

difference in the size of the resulting tubers. Where a 15 in. spacing was used 79 per cent. were over 3 oz. in weight, while in the case of the 4-6 in. spacing 74 per cent. were over this weight. The closer spacing gave a slight increase in yield, but this in most seasons would be offset by the cost of the additional planting material.

Onions.

Onion mildew caused serious damage to the 1954 crop of some 2,000 acres. In addition, wet weather hampered the cultivation of late crops, and 400-500 acres which became overgrown with weeds had to be ploughed in. Cyclonic March rains caused considerable losses to the 1955 crop, and the wet autumn delayed further planting till late April and early June.

Lockyer Valley seed production was seriously reduced last year by mildew attack. The position, however, has been considerably alleviated by the commercial production of "Early Lockyer" strains by a southern seed firm.

Lucerne.

Although 75 per cent. of the 12,000 acres of lucerne grown in the Lockyer Valley is provided with irrigation facilities, only one irrigation was necessary over the past year to provide a total yield of 7-8 tons of hay per acre. Most of this hay is sold on the Brisbane market. The remaining acreage is used for grazing.

At seeding rates of 1-2 lb. per acre, both in sward and in rows, lucerne is providing excellent grazing in 20-25 in. rainfall areas such as the Chinchilla and Wandoan districts. Lucerne is also playing an important part as a pasture component with green panic and Rhodes grass on the northern and western Darling Downs.

PASTURES.

The growth of native pastures has been very good throughout the State. Dry weather checked growth for a time in December and January in the dairying and fattening districts of south-eastern Queensland but the position was relieved by late summer rains. Heavy autumn and winter rains which followed should ensure the successful establishment and growth of winter pastures on the Darling Downs, and the development of white clover in the paspalum and kikuyu pastures of the coastal dairying districts.

Stock-owners continued to exhibit an active interest in pasture improvement. There are now some 150 pasture trials and demonstrations in progress from Cloncurry and Cape York Peninsula to the southern border.

The continued financial support of the Australian Dairy Produce Board has assisted materially in the maintenance of about 120 pasture trials on dairy farms. In many districts the results of these trials have made it possible to lay down definite recommendations relating to pasture improvement.

Increased demands for pasture seed allied to the difficulties encountered in harvesting seed contributed largely to higher prices. The result has been a steep increase in the cost of establishing sown pastures. Prices of from 12s. to 20s. per pound for grass seed are uneconomic for the grazier who wishes to plant large areas of country of relatively low carrying capacity. The remedy for this, as far as summer-grown grasses and legumes are concerned, lies with the stock-owners themselves. Seed production areas should be established on every property where extensive plantings are envisaged. An increasing number of farmers on the Darling Downs and in the Burnett and Callide Valleys are now harvesting pasture seeds for their own use and for sale and this should help to reduce prices in future years.

Trials on the Darling Downs have shown that it is possible to reduce planting rates by more than half by using good quality seed and well-prepared seedbeds. In this way, the cost of establishing pastures on arable land can be reduced by as much as £2 per acre.

The Royal National Agricultural and Industrial Association, with the assistance of Departmental officers, inaugurated a pasture competition during the year. The publicity which it has received has been very useful in bringing the benefits of pasture improvement to the attention of many stock-owners.

Pasture Species.

The grass which aroused widest interest throughout the State was buffel grass (*Cenchrus ciliaris*). There is little doubt that this grass provides one of the most useful aids to pasture improvement ever presented to graziers in western and north-western Queensland and in parts of Cape York Peninsula. Its ability to persist and produce nutritious and palatable feed on many red-brown soil types now carrying inferior wire grass or spinifex, and also on cleared gidyea land, has been amply demonstrated. It is estimated that carrying capacity could be trebled in many areas by the use of this grass.

The position with regard to buffel grass types is still confused, owing to the behaviour of the Western Australian strains. The common purple-seeded Western Australian form characterised by small relatively heavy seeds has continued to give lower yields than the common Gayndah strain in all plots in central and eastern Queensland. A large number of seed samples have been obtained from Western Australia for testing under Queensland conditions.

Two summer-growing species, green panic (*Panicum maximum* var. *trichoglume*) and Rhodes grass (*Chloris gayana*), have again shown their value on the eastern and northern Darling Downs, particularly when grown with lucerne. These grasses will provide a grazing season 2-2½ months longer than the native pastures, in addition to providing more nutritious feed. *Phalaris tuberosa* has also shown its ability to provide valuable grazing on the Darling Downs in conjuction with lucerne and the relatively drought-resistant barrel medic (*Medicago tribuloides*) and in some cases in combination with various clovers.

Legume deficiency in pastures still remains a major problem facing stock-owners in Queensland. Nevertheless, over a large section of the coastal and sub-coastal districts pasture legumes can be grown satisfactorily. Legumes of which seed is readily available and which are suitable for these districts are lucerne, white clover, Townsville lucerne (*Stylosanthes sundaica*), centro (*Centrosema pubescens*) and barrel medic. Other legumes such as phasey bean (*Phaseolus lathyroides*) and stylo (*Stylosanthes gracilis*) also have a place in the pastures of eastern Queensland, but regular seed supplies are not available in commercial quantities.

The isolation of bacterial strains which are effective for inoculating subterranean clovers (*Trifolium subterraneum*) has increased the possibility of this species being used as a pasture component in south-eastern Queensland.

The annual legume Townsville lucerne is spreading steadily in the Bundaberg-Gympie region, and areas of up to 20 acres have been successfully established in spear grass country west of Gympie. The perennial tropical legume centro has shown its ability to suppress blady grass and withstand stocking and burning in the coastal tropics, while trial plantings as far south as Brisbane have given promise of success.

With few exceptions, wherever paspalum, kikuyu or narrow-leaf carpet grass (*Axonopus affinis*) thrives, it has been possible to establish white clover in trials by using superphosphate and the correct seed inoculum.

A further season's work with white clover selections has confirmed the earlier finding that some selections combine good plant vigour with earliness. Seed of these vigorous early types is being increased so that yield trials can be established.

A trial to investigate the changes in protein and fibre levels of three important native grasses growing on the open plains in north-western Queensland has been commenced at Toorak Field Station. The grasses are Mitchell grass (*Astrebla* spp.), Flinders grass (*Iseilema* spp.) and button grass (*Dactyloctenium radulans*).

The changes in protein content show that button grass deserves its reputation of being the most nutritious grass in the north-west. In all the grasses protein levels drop very suddenly after a period of 4-5 weeks' growth. The low values for Mitchell grass and Flinders grass are typical of these grasses wherever they grow.

Fertilizer Trials.

Use of fertilizers on pastures in Queensland, although small, is increasing appreciably from year to year. Trials have shown that marked responses to fertilizers, mainly superphosphate, can be expected from much of the coastal dairying country in the State, especially where pasture legumes are present.

At Crediton, on the Eungella Range near Mackay, it has been shown that the grey clay loams overlying yellow subsoil require annual dressings of superphosphate at one bag (187 lb.) per acre to maintain good clover growth.

The role of sulphur in parts of the Mary Valley has been shown to be important in a trial which compared the effects of sulphur alone, sulphur and lime in gypsum, and sulphur and phosphate in superphosphate when applied to white and red clovers. The results are shown in Table 2.

TABLE 2.

EFFECT OF SULPHUR ON CLOVER GROWTH AT CONONDALE.

Treatment.	Sulphur Equivalent.	Clover Growth.	
		Ground Cover.	Average Height of Plants.
	Lb.	%	In.
Control	..	53·2	11
Sulphur 21 lb./ac. ..	21	80·0	17
Gypsum 1 cwt./ac...	19	73·2	18
Super 1 cwt./ac. ..	9·5	86·6	18
Super 2 cwt./ac. ..	19	93·2	18

On grey alluvial soils at Mooloolah, on the near North Coast, a marked response in white clover and paspalum has again been obtained following an initial application of lime at 1 ton per acre in 1952 with annual applications of superphosphate at 2 cwt. per acre and copper sulphate at 14 lb. per acre. It will be seen from Table 3 that plots receiving super and copper or copper alone are inferior to that receiving the complete mixture. The control plots are inferior to all treatments.

TABLE 3.

EFFECT OF LIME, SUPERPHOSPHATE AND COPPER ON WHITE CLOVER AND PASPALUM AT MOOLOOLAH.

Treatment.	Percentage Ground Cover.		
	White Clover.	Paspalum.	Narrow-leaf Carpet Grass.
Lime, super., copper	20·3	21·9	57·8
Super., copper ..	13·2	13·0	73·8
Copper	10·5	16·2	73·3
Control	6·4	10·4	83·2

In view of the importance of copper in animal health, the ability of four pasture plants to absorb copper from the soil has ben studied in co-operation with the Animal Research Institute and the Chemical Laboratory. The results show clearly that even when grown on the same soil type in the same season, white clover, paspalum, blue couch (*Digitaria didactyla*) and pitted blue grass (*Bothriochloa decipiens*) absorb different amounts of copper.

There is also evidence that narrow-leaf carpet grass, which now dominates much of the coastal dairying country, has a low mean copper absorption rate, with a copper level usually below the minimum required by the grazing animal.

At Chilverton, on the Atherton Tableland, green panic and paspalum pastures treated with lime at 1 ton per acre and superphosphate at 3 cwt. per acre have each given an approximate carrying capacity of 1 beast to 2.5 acres, compared with 1 beast to 5 acres for unimproved carpet grass-bracken fern pastures.

Grazing Trials.

Striking increases in milk and butterfat production are being obtained from the use of improved pastures. There is now ample evidence from sown pastures of up to five years of age that stable mixtures of green panic and lucerne and Rhodes grass and lucerne can be maintained successfully under a practical grazing routine.

Six acres of a grey clay loam on the Coochin flats near Boonah were planted in April, 1954, to phalaris, cocksfoot, perennial ryegrass, white clover, red clover, and cluster clover. The area was grazed in late September for 14 days for 5½ hours per day in conjunction with native pasture. Butterfat production rose to 1,571 lb. for the fortnight, compared with a production of 1,331 lb. for the previous fortnight when the cows were on lucerne and native pasture.

On stony hillside pastures at Maclagan, grazing for 2 days on 9 in. regrowth of a green panic-lucerne pasture increased the milk production from 70 cows by 40 gallons over this period.

At Bell, when 20 acres of green panic-lucerne-barrel medic pasture were strip grazed for a fortnight, butterfat production rose from 4.3 lb. per cow to 5.2 lb. per cow in the first week and to 5.5 lb., in the second week.

Irrigated Pastures.

The area sown to irrigated pastures has increased steadily in southern Queensland. The biggest gain occurred in the Logan and Albert Rivers district, where 400 acres of pasture were effectively established.

A substantial increase in irrigated pastures is expected in the Brisbane Valley and Nanango districts. The irrigation potential has been increased in the Nanango area by the development of irrigation supplies from 25 bores. An increase in irrigated pastures can also be expected in the Callide Valley when the scheme to develop underground water has been implemented.

Results again proved that pastures are weakened if irrigation is delayed unduly during summer dry periods. Overgrazing at this time is also harmful. Poor ground cover exposes the clover and grass crowns to excessive soil temperatures (140-150°F.) which may actually destroy some of the pasture species. It is desirable, therefore, to develop a pasture with a summer-growing grass component capable of giving good ground cover. For coastal areas, paspalum is valuable in this regard, while for inland areas where frosting is severe it is possible that reed canary grass (*Phalaris arundinacea*) may be suitable.

The use of nitrogenous fertilizer to promote rapid clover growth on soils of low fertility has been successful, especially in areas where initial inoculation of the legumes was faulty. The necessity for inoculation of clover seed with an effective bacterial culture was again demonstrated.

Water storage and contour furrow irrigation are attracting much attention from graziers and farmers and it is expected that increased advantage will be taken of local conditions which favour these practices.

"BRIAN PASTURES" RESEARCH STATION.

Investigations into the problems of beef cattle pastures are now well established at the "Brian Pastures" Research Station at Gayndah.

A wide range of pasture species has been established and these are now under observation. The species which survive the progressive and systematic screenings in the nursery, small sward plots, and small-scale grazing trials will be tested finally under range conditions.

Five methods of establishing sown pastures are being examined in an effort to determine the most economical way of obtaining productive sown pastures. These methods are:—Planted in cultivated land following cropping; broadcasting after the native pasture has been burnt and chisel ploughed; broadcasting after burning the native grass, followed by discing; drilling in seed with a disc drill after a burn; and broadcasting into burnt-over native pastures. Plantings will be made in each of three successive years in order to determine the effect of seasonal changes on the relative efficiency of the methods used.

Three methods of incorporating pasture legumes into native grasslands are being studied. These include:—broadcasting after burning; broadcasting after burning followed by discing; and drilling into burnt pastures. This trial will also be repeated for three years.

A large-scale trial involving Rhodes, green panic and buffel grasses and the legumes lucerne and phasey bean was commenced in January, 1955, when grazing began with five comparable steers being used on each pasture mixture. The stocking rate is 1 beast to 4 acres. Each mixture was sown in five paddocks of four acres each, and the grazing rotation is two weeks on and eight weeks off. The stock on native pastures are grazed at the rate of 1 beast to 8 acres. It will be at least 12 months before any opinions can be formed regarding the value of the sown mixtures.

Final results of the trial on the control of eucalypt regrowth will not be known until December, 1955.

FODDER CONSERVATION.

Efficient property management is a key factor in combating losses of stock and production caused by droughts and the dry periods which are characteristic of Queensland's climate.

Water storage, pasture and stock management, the use of grazing crops, irrigation and the conservation of stock food as hay, silage, or grain are all important aids which the stock owner can enlist on his side. In most pastoral and agricultural districts one or more of these forms of production and maintenance insurance can be exploited.

Improvements on properties along these lines are definitely increasing but a more rapid and widespread acceptance of these practices is required. A greater amount of conserved fodder is at present held in agricultural districts than has been the case for some years —a position which has been largely influenced by the good season experienced. These reserves, however, would be too small to be really effective in meeting the drought which is sure to come within the next few years.

The development of special machinery to reduce the manual labour needed in fodder conservation offers bright hopes that the storage of fodder will be practised more widely and consistently in this State. New machines such as the buckrake, the hay baler and the forage harvester are becoming more commonly known and appreciated. Pit silos have been shown to be particularly suitable for the storage of silage.

Better methods of feeding out stored silage are still needed, but there is reason to believe that this important phase of fodder conservation practice will be more efficiently mechanised in future.

SOIL CONSERVATION.

Further development of the trend towards improved land usage practices was a pleasing feature of soil conservation progress during the year. It was reflected in the substantial increase in the area of agricultural land temporarily put down to sown pastures and the much greater use of tined implements for land cultivation.

These practices are by no means general, but they point to a changing pattern in Queensland agriculture which is marked by an increasing recognition of the importance of livestock in a balanced farm economy and a keener awareness of the value of good soil husbandry for the maintenance of productivity.

The co-operative approach to soil conservation problems is receiving wider recognition, as evidenced by the interest shown by a number of farmer groups and local authorities in catchment control schemes. It is most important that this be encouraged. Erosion does not start or stop at boundary fences and control measures can be applied most effectively and economically when they cover the whole of a vulnerable area.

Soil Erosion.

The first and last quarters of the year under review were very wet in most of the agricultural areas of the State. Few high intensity storms were recorded but on a number of occasions protracted rains were received when the soils were already saturated. As a consequence of the unusually high runoff, erosion occurred in all agricultural areas.

The cyclone of July, 1954, caused serious erosion damage in the Bundaberg and Isis districts and to a lesser extent in the Central and South Burnett areas. On the western Darling Downs some local flooding occurred on the plains areas but damage was negligible on the eastern Downs.

The most serious losses in all districts occurred during the months of March and April, 1955, when high rainfalls were registered throughout the State. Flooding occurred in practically all of the State's streams but was most severe in coastal areas. Erosion occurred on the agricultural alluviums adjacent to these streams and crop losses assumed serious proportions. Siltation of streams was high but the extent of this type of damage is difficult to assess.

Appreciable damage occurred on the Darling Downs, where the protracted rains coincided with a period when the wheat fallows were in fine tilth and the soil moisture level was already high. In the Central Highlands, where land subdivision is in progress, erosion losses were serious on cultivations.

Extension Activities.

While the land reclamation problem is a source of considerable concern, the development of improved systems of land utilisation is the most important phase of the long-term soil conservation programme and the extension approach is governed by this aspect. Progress has been made towards the adoption of improved agronomic practices by landowners, but more is required.

The advent of the chisel plough has stimulated thought in respect to land cultivation methods. Over 400 chisel ploughs were bought by Darling Downs farmers within 12 months, and in the South Burnett district a large number of these implements were purchased.

While it is rather early to make a valid appraisal, observations during the year indicate that the chisel plough and other similar types of tine machinery can perform a most useful function in soil conservation work. Rainfall intake under certain conditions can be improved and crop residues retained on the soil surface. However, the work of the chisel plough must be regarded as being complementary to other soil conservation measures. It certainly cannot be regarded as a complete substitute.

There has been a substantial increase, estimated at 2,000 acres, in the area of improved pastures sown on the Darling Downs this year. This interest is expected to be sustained, partly because of the recognition of the importance of livestock in a balanced farm economy and partly because of uncertainty concerning future grain markets.

On the Atherton Tableland appreciation of the value of short-term pastures in rotation with maize and peanuts appears to be growing, but to date it has been restricted in application to the grassing down of badly eroded patches. Extension of this practice could lead to the general application of the ley pasture concept, which is an essential part of a soil conservation system.

Stubble burning was more frequent than usual on the Darling Downs following the last wheat crop, the contributing factor being the difficulty experienced by farmers in handling the heavy, weedy and tangled stubble with orthodox equipment.

During the year approximately 5,000 acres of eroded cultivated land were stabilised by the use of various types of mechanical control structures. Pondage and diversion structures aggregating 4,000 chains in length have assisted in intercepting runoff from upper slopes. A total of 127 waterways was designed and constructed; these are in the process of stabilisation with vegetation.

Earthmoving contractors have assisted substantially in soil conservation programmes during the year. In the Darling Downs and South Burnett districts seven contractors are operating practically full-time and several others are engaged periodically. Seven Shire Councils have assisted farmers by hiring out equipment; the leader in this sphere is the Pittsworth Shire Council, which for some years has made one earth-

moving unit available for soil conservation work on a full-time basis and has recently allocated another unit for this work.

Because of the detailed attention required in the preparation and implementation of a soil conservation plan, the farm visit has been the spearhead of the extension work. Other extension avenues utilised include radio talks, addresses to primary producers' organisations, the erection of displays at country shows and a special Junior Farmers' soil conservation school. In addition, inspection tours of Darling Downs soil conservation projects were arranged for groups of students and Junior Farmers aggregating 300 persons.

The Allora Soil Conservation Group continues to expand. This is a voluntary body of farmers interested in furthering soil conservation work, particularly in relation to agronomic aspects. It has been an effective agent in the district soil conservation programme and might well serve as a pattern for other districts.

Catchment Planning.

Plans have now been completed for three catchments and a further four have been partly planned. In districts such as the South Burnett and Atherton Tableland, where water disposal systems are not clearly defined, planning on a catchment basis is most necessary. Following finalisation of catchment plans the procedure is for projects to be initiated by the appropriate local authority in accordance with the approved plans.

The Booie Road project in the South Burnett district has been delayed pending consideration of financial aspects by appropriate authorities.

Work has been initiated on portions of the Memerambi catchment in the South Burnett district and the Silverleigh catchment on the Darling Downs. In these catchments the work is being executed by the individual farmers, in accordance with catchment plans, instead of having them implemented as group projects. There are some advantages in this approach, since it avoids many of the delays associated with the organisation of group projects.

At Atherton the Halloran's Hill–Cairns Road plan has been considered by members of the Atherton Shire Council and interested landowners. Action has been taken to organise a group project.

On the Darling Downs the contour plan of the Tabletop catchment has been completed and planning of the control scheme is proceeding.

Investigations and Research.

A review of the soil conservation research programme was made during the year. As a result, steps were taken to organise programmes on a district basis and under the supervision of the district soil conservation officers. Investigations were commenced in various parts of the Darling Downs, South Burnett and Central Highlands with respect to land preparation methods, waterway stabilisation and gully stabilisation.

Observations on the rate of colonisation of various grass species for gully control on the clay soils of the Central Highlands indicated that African star grass can be established most readily. It colonises at a greater rate than the other grasses tested. Common couch grass was slightly superior to kikuyu grass but both spread much less rapidly than African star grass. Species of *Digitaria* tested were not promising.

On the eastern Darling Downs very encouraging results were obtained with kikuyu grass. The grass was planted as runners in strips varying from 18 to 24 in. apart in September last. A 40 per cent. ground cover was obtained at the end of two months, 70 per cent. within four months, and total cover was recorded by the end of the sixth month. The complete cover was estimated to be capable of carrying sustained water flow at velocities of up to 8 ft. per sec.

In the maize stubble mulch trial at Kairi Regional Experiment Station no evidence was obtained that mulching lowers grain yields (mean yield 50 bus. per acre). There was, however, a significant increase in disease incidence in the crop on the plots where the maize residue had been retained (6.7 per cent. diseased) in comparison with those in which the residues had been raked and burned (2.6 per cent. diseased). It is apparent that the trial must be continued for a number of years before definite conclusions can be drawn on the relative merits of retaining stubble or burning it in this area.

In the land use trial at the same Station, runoff was recorded on seven occasions and followed the same pattern as in the previous year. In general, the runoff was related directly to density of ground cover, being least in unmown lucerne and thick cowpea stands. A marked increase was noted in the former when the lucerne was cut and removed. Runoff was high in areas with a young maize crop and was comparable with a pasture area in which the grasses were tussocky in habit with compacted bare soil between the tussocks.

A strip cropping exploratory project at Pittsworth continued to function satisfactorily with respect to erosion control, but further observations are required before any definite assessment of its value can be made.

A trial was initiated on the eastern Downs to evaluate the effect of fertilizer treatment on the density of ground cover of Rhodes grass in an established waterway. Observations indicated marked benefit from the application of sulphate of ammonia, but no apparent response to the muriate of potash or superphosphate.

In land preparation trials at Hermitage Regional Experiment Station, one on shallow soil (mean wheat yield 23.8 bus. per acre) and one on a deeper type (mean yield 30.8 bus. per acre), there were no significant differences in yields. Treatments included deep and shallow land preparation combined with various forms of stubble disposal and with Poona pea green manure crops.

AGRICULTURAL MACHINERY.

With the exception of imported agricultural equipment, which from time to time is subject to delays in delivery, the supply/demand position of agricultural machinery has generally been satisfactory. Further expansion is taking place in all fields of mechanised agriculture and there has been a notable advance in raising the output per man-hour.

Increasing interest is being taken in stubble mulch practices to prevent soil erosion, conserve soil moisture and preserve soil structure, and this has created a demand for new implements such as chisel ploughs. Stubble mulch planters are now required which can operate when the soil surface is protected by a layer of organic residues.

During the year there has been an improvement in the availability of peanut harvesting equipment. This has been due to delivery of imported machines in time for this season's harvest, and also to an increase in production of locally manufactured peanut equipment.

Further mechanisation in the tobacco industry is being studied. Arrangements have been made for the importation of two mechanical transplanters and two soil injectors for nematode control. These machines will be tried extensively in all tobacco areas.

The number of primary producers taking advantage of the services provided by the machinery section in the Department has increased appreciably. The close liaison established with trade organisations has been maintained and extended.

BUREAU OF TROPICAL AGRICULTURE.

Rainfall for the year ended May 31, 1955, was 141 in., approximately 20 in. above the average. Little rain fell in the months of July, September and November, but October with 15 in. broke an otherwise dry spring. Heaviest rain fell in February (39 in.), but March and May were also well above average. Rainfall at Utchee Creek was 10-15 in. less than at South Johnstone.

Pastures.

In the 9-year-old rotational grazing trail, the method of management was altered. Previously all plots had been grazed by the same number of stock in a regular rotation throughout the year. In the past season the stock numbers were varied in accordance with the estimated carrying capacity of each mixture when grazing was due.

Under this system 10 steers were kept constant throughout the varying grazing rotations and others were added as required. At commencement of grazing (31/8/54) these 10 steers averaged 809 lb. in weight, and at the conclusion of the seventh rotation (3/5/55), 1,179 lb. Thus the average weight gain was 370 lb. per beast, representing a daily weight gain of 1.5 lb. During this period the carrying capacity ranged from 2 beasts to 3 acres for the molasses grass and puero mixture to nearly a beast per acre for guinea grass and stylo (now partly guinea grass and centro).

These experimental paddocks have departed substantially from their original composition. Experience has shown that most of the original mixtures could now be replaced by better grass-legume combinations.

At Utchee Creek, in contrast, stock have been grazed continuously on various grasses and pasture mixtures. Under these conditions the best pasture has undoubtedly been the mixture of guinea grass and centro. While most other paddocks have been maintained in satisfactory condition by varying the stocking rates, para grass responded most unfavourably to the continued grazing treatment. It was necessary with this grass to remove the stock occasionally to allow the grass to recover; even so, intrusions of molasses grass occurred.

Tea.

Good crops of leaf have been harvested this year from the plucking and manufacturing experiment which was initiated in 1952. Samples were manufactured at quarterly intervals, and tea-tasters have continued to give satisfactory reports on these. Mechanical harvesting by small hand-machines has involved approximately 40 per cent. of the time required for hand-plucking of a similar area. On the other hand, mechanical harvesting has provided some 80 per cent. of the dry tea yield obtainable by hand-plucking. Over the period of the experiment, the yields of dry tea per acre per year have been 1,239 lb. for hand-plucking and 1,028 lb. for machine-picking.

The old seed garden has been maintained and a new garden established. Hedge plantings for large-scale mechanical harvesting are making good progress, with the assistance of windbreaks of pigeon pea, a ground cover of *Desmodium* spp., and shade trees of two different genera.

Miscellaneous.

Miscellaneous activities have covered grass palatability trials, plant introduction plots, and legume seed production areas, together with small agronomic trials of rice, cowpeas and ramie fibre.

TOBACCO EXPERIMENT STATIONS.

The tobacco farm at Mareeba has been closed down and the development of a new much larger station at Parada is now in progress. Clearing has been carried out and arrangements made for the erection of some buildings. Work on the Inglewood Tobacco Experiment Station, which is still in the developmental stage, consisted of tobacco seed production and the continuation of the rotation trial established in the previous year.

Methods of nut grass control and chlorine uptake were studied on the Clare Tobacco Experiment Station. The chemicals C.B.P. 55 and DD each at 90 gallons per acre and methyl bromide at 3 lb. per 100 sq. ft. gave good control of nut grass but were too expensive. C.B.P. 55 also caused a serious taint in tobacco.

The direct relationship between chlorine content of irrigation water and uptake of this element by the tobacco plant has been established. Excess chlorine in tobacco causes poor burning and is undesirable. With the general usage of irrigation for tobacco in Queensland, further study of the chlorine problem is considered to be an important undertaking.

REGIONAL EXPERIMENT STATIONS.

Mr. W. G. Wells, Director of Regional Experiment Stations.

During the 1954-55 year the programme of investigations on the Regional Experiment Stations has been materially extended, with a consequent increase in the acreage utilized for experimental purposes. A new Station at Millaroo, on the Burdekin River some 40 miles upstream from Ayr, has been started and the first experiments were planted in April. A dairy herd has been established at Biloela, piggeries have been established at Hermitage and Biloela, using respectively Berkshire and Large White stock, and sheep grazing studies have commenced at Hermitage.

Particular attention has been directed at all Stations to the expansion of long-term rotation studies, some incorporating animal grazings. Methods for successful fodder conservation are being investigated at all centres and irrigated pastures have now been commenced at Biloela. In addition to results from agronomic research, important data have been obtained regarding pastures and their management. Some valuable information on seed production and harvesting techniques is now available.

At most of the Stations, seasonal conditions have been good although the wet season at the northern Stations was considerably later than usual. The experimental results are briefly reviewed under separate headings for each Station or in the reports of the Branches conducting some of the studies on the properties.

The monthly rainfalls at the major centres are reported below.

TABLE 1.

RAINFALL—1954–55 SEASON.

Month.	Hermitage R.E.S.		Biloela R.E.S.		Ayr R.E.S.		Kairi R.E.S.	
	1954–55.	Warwick Means.	1954–55.	Means.	1954–55.	Means.	1954–55.	Means.
July	1·21	1·80	2·46	1·27	·77	1·91	·63	·86
August	2·23	1·40	1·98	·74	·35	·47	2·24	1·71
September	1·99	1·75	·41	·92	·14	·18	·30	·58
October	7·58	2·32	2·53	2·03	1·30	·96	2·24	2·06
November	3·24	2·66	2·39	2·92	2·23	2·16	·62	2·45
December	·56	3·50	3·21	3·38	1·43	1·03	·83	1·37
January	2·74	3·58	3·29	4·20	9·98	17·04	4·63	8·87
February	2·03	3·10	6·34	4·94	16·77	10·39	14·01	11·19
March	2·92	2·60	4·34	2·74	11·91	9·98	23·81	10·24
April	2·82	1·60	1·83	1·62	2·35	2·90	2·26	4·51
May	2·95	1·48	4·67	1·59	14·18	2·57	2·87	2·01
June	0·41	1·70	·18	1·64	·38	·49	2·53	1·47
Total	30·68	27·49	33·63	27·99	61·79	50·08	56·97	47·32

HERMITAGE.

The 1954 winter crops, which could not be sown until a planting rain occurred in July, experienced sufficient August rainfall to maintain fair growth, but abnormal October rains yielding 7.58 in. and accompanied by hail caused flooding and subsequent damage to the maturing crops. Summer plantings commenced very satisfactorily in November but the following summer months were relatively dry. Adequate rain was received in the autumn to commence the winter plantings in May and June under favourable conditions. Severe frosts were recorded in late June. The Station experienced two cyclonic blows in July, 1954, and March, 1955, and although rainfalls were light, winds caused some damage.

General.

During the year two new long-term rotational cropping programmes were initiated. Both rotations follow an 8-year plan. "A," on two soil types, uses grain sorghum, lucerne, oats and wheat, with allowance for animal grazing of the four years of lucerne and the oats, while "B," which was designed to suit the farmer without grazing animals, was established on fertile alluvial soil to measure the effect of green manure crops and certain cultural methods on yields and quality of the two main grain crops, wheat and sorghum.

Testing of selected standard varieties of wheat, grain sorghum and sunflowers has been continued, and multiplication of seed of pure and new varieties of cereal crops has formed an important phase of the Station's work. Valuable contributions to Queensland agriculture with which the Hermitage has been associated have been the development of Bovah oats to counteract the ravages of Victoria blight, and of Spica wheat, which is now in general production.

Facilities have been provided for plant breeding and studies of a wide range of wheat and oat strains and soil management trials originated by soil conservation officers have yielded new results.

Crops.

Wheat.—Both June and July plantings made very satisfactory growth on current rainfall until October, when 7.58 in. created saturated soil conditions and lodging of the maturing crops. Harvesting of the crops commenced in mid-November.

Standard varietal trials with both quick-maturing and slow-maturing varieties were conducted, the former being more severely damaged by wind at maturity with proportionate decline in yield. Of the early varieties, Spica excelled with 31.6 bus. per acre; it was closely followed by Seafoam and Gabo. In the long-season group, Lawrence yielded 33 bus. per acre, followed by Festival, Charter, Celebration and Puseas in that order.

A depth-of-ploughing experiment sown to wheat resulted in only slight differences—areas ploughed to 4 in. depth yielded slightly more than areas ploughed to 6 in. and 8 in. However, on split plots where superphosphate was applied at ploughing depth there was an increase in yield with superphosphate applied at 8 in. None of the differences were significant in the first season and the trial is being repeated on the same land.

Seed of Spica wheat for production of foundation stocks of pure seed and known as "mother seed" has again been produced under strict supervision.

Wheat quality studies have been continued in conjunction with the Chemical Laboratory, with indication that soils of high fertility produce grain of high protein content. Puora wheat on rich alluvial flat land produced 33 bus. of grain and removed 40 lb. of nitrogen per acre in the grain, which had a protein content of 12.7 per cent., whereas a crop on shallower soil of volcanic origin overlying sandstone yielded 30 bus. and removed 33 lb. of nitrogen per acre in the grain, which had only 9.5 per cent. of protein.

Oats.—The ravages of Victoria blight have necessitated detailed study and multiplication of resistant or partly resistant high-yielding varieties. Following the 1953 failure of Vicland, the new variety Bovah was multiplied on an area of 3 acres. It yielded 39 bus. per acre, and the seed was made available to pure seed growers in the Monto, Gayndah and Kingaroy districts. To ensure wider distribution of Bovah, 30

acres of it have been sown at Hermitage for seed production in 1955. Pure seed areas of Vicland, Garry, Klein, Fultex and Orient oats were also grown in 1954.

Another likely variety, Benton, is being multiplied in 1955.

Lucerne.—Lucerne is being used in all rotations which include grazing. Under the dry conditions it was also possible to harvest 4 cwt. of good seed from a small bulk area in the late summer.

Grain Sorghum.—The dry summer conditions which followed satisfactory germination of sorghum experiments adversely affected results. The varietal trial, which had a uniformly heavy stand, failed under December stress conditions, whereas a light stand of Kalo which survived this dry hot period yielded 36 bus. per acre. Purity testing of certified seed stock of various varieties was continued.

Sunflowers.—In a varietal trial of the four leading varieties, Giant Russian outyielded Polestar, Jupiter and Sunrise, but the height and unevenness of Giant Russian make machine harvesting difficult. In the two previous years Jupiter had given the best results. Sunflowers are a useful crop for this region and the trial yielded up to 1,110 lb. per acre under relatively dry conditions.

Maize.—Hybrid maize trials were continued in association with the Plant Breeder of the Queensland Agricultural High School and College. Yields were generally low under dry summer conditions but the location of this Station allows close study of early-maturing and high-yielding strains. Some 20 single-cross lines, four double-cross hybrids and an open-pollinated variety were included in the experiment.

Miscellaneous.—Nine bushels of mother seed of Strain 17 Brown Beauty beans were produced, pumpkins were grown for pigs, and cowpeas and Setaria were grown as green manure crops.

Pastures.

The grass and legume nursery has been continued with study of 26 summer and 40 winter species and many strains of these species. Of the winter grasses, species of *Phalaris, Bromus,* and *Lolium* have been most promising and a wider range of introduced strains has been established during the year. The Hunter River strains of lucerne are still superior to all imported material. Lucerne and clover observations have been extended in grazing areas. Of the summer growing perennials, Rhodes and green panic grasses are still outstanding, although paspalum is valuable on wet areas and species of *Cenchrus* and *Digitaria* show promise for the drier, well-drained soils.

Sown pastures for grazing by sheep became well established during the year. Lucerne and Rhodes grass alone and with the addition of Wimmera ryegrass and phalaris produced satisfactorily on the shallower hillside area, and burr medic, which germinates readily in autumn, added to the quality of the pasture. Winter-sown pastures incorporating lucerne with row-cultivated phalaris, perennial ryegrass, H. 1. ryegrass and Wimmera ryegrass and *Bromus* spp. were established last year and conditions for growth have been satisfactory in 1955. Summer plantings of green panic and lucerene experienced dry conditions and in one area where a light stand was obtained weed competition was severe.

Observations on methods of introducing superior pastures on native grassland have been continued.

BILOELA.

Although the 1954 autumn rains were barely sufficient to allow planting of winter crops, a good soaking rain group occurring at mid-July provided ample moisture to maintain all experiments until the plants connected with the good supply of subsoil moisture resulting from the summer rains. Consequently, growth of winter crops was very satisfactory. Suitable spring and early summer rains were experienced for timely planting of most of the summer crops, but the delay of the wet season affected growth of these crops and only moderate yields were obtained. Satisfactory progress was achieved, however, in most of the comprehensive programme conducted and the more important findings are included in the following summaries.

Crops.

Oats.—Vicland and Fultex oats planted in early July, 1954 grew very satisfactorily without being affected by Victoria blight (*Helminthosporium victoriae*). In the previous season, a delayed early September planting which experienced above-normal rain in October and November was ruined for seed production by this disease. The effect of the earlier planting in June, 1954 and the more favourable seasonal conditions experienced is reflected in the yields of the hay varietal trial, which averaged 2.3 tons of hay per acre, the leading varieties being Garry and Bovah, which were only slightly superior to Belar and Vicland. In a grain yield of the same range of varieties, an average production of 44.6 bus. per acre was obtained; Vicland, the leading variety, produced 53.2 bus. per acre. The results as a whole indicate the superiority of Garry and Vicland as dual-purpose hay and grain varieties for this district when planted in the late autumn.

Wheat.—In the usual standard wheat varietal trial, an average yield of 39 bus. per acre was obtained, with six varieties producing from 40.5 to 43.3 bus. A general tendency was noted for early heading varieties to outyield the later types. This characteristic, plus a severe infestation of leaf rust, materially reduced the yields of Gabo, a variety which has tended to lead in previous trials at this Station. In a rate-of-seeding trial ranging from 30 to 90 lb. per acre, the highest rates produced the best yield of grain, whereas under dry conditions last season the lowest rate was the best.

Cotton.—The results obtained in a comprehensive programme of experiments embracing dryland and supplementary irrigation conditions indicated once again the merits of ample subsoil moisture to offset stress conditions occurring before the onset of the wet season. Where insufficient subsoil moisture prevailed in this period severe loss of crop occurred, and following heavy rains, rank vegetative growth developed which later reduced the efficiency of the mechanical harvesting machines. Insect damage throughout the second half of the season also materially reduced the top crop. The value of growing cotton in the first and second season after grassland of at least four years' establishment was again well demonstrated. An enlarged programme of defoliation investigations was conducted but the economics of this work are still indefinite.

Grain Sorghum.—An early January planting of the standard varietal trial demonstrated once again the risks associated with planting grain sorghum in the Callide Valley after mid-December. Although satisfactory plant growth was maintained, a very heavy midge infestation occurring at flowering stage of all varieties so severely reduced yields that they did not represent the potentialities of the varieties. However, Alpha produced 24.8 bus. per acre, an increase of 100 per cent. over the next best variety. As there was no correlation between heading dates and yields, the results may indicate that Alpha has some degree of resistance to midge damage.

Part of a mother seed area of Sugardrip sweet sorghum yielded silage material at the rate of 15 tons per acre and the rest produced 30 bus. of seed per acre.

Lucerne.—The results obtained in the main investigations related to this crop may be summarised as follows:—The trial to obtain maximum hay production with supplementary irrigation yielded well. During its 3½ years of establishment, a total of 37.4 tons of hay per acre has been produced on a total moisture consumption of 114 in. of rain and 124 in. of supplementary irrigation, or an average of 6.5 in. of water per ton of hay. The use of approximately 800 lb. of water to produce 1 lb. of water-free hay indicates a satisfactory degree of efficiency of water consumption under the climate conditions experienced. Under conditions of supplementary irrigation for both treatments during 12 months, lucerne produced twice the tonnage of forage that was obtained from an adjacent crop of cowpeas and a following crop of oats. A distinctly poorer soil structure is now evident in the area that has been double-cropped annually for the last three years than in the lucerne area of the same age of establishment.

Soybeans.—In contrast to previous seasons' results, both Clemson and Rose Selection No. 2 soybeans outyielded Nanda. Selection No. 2, a strain selected at Biloela out of the Rose variety, gives promise of being a superior type for machine harvesting and produced 754 lb. of beans per acre. Rate-of-seeding trials appear

to indicate that plant population per row foot is more important than variations between 27, 34 and 42 in. row spacings.

Pastures.

Lucerne-grass pasture.—The inclusion of lucerne in both row-cultivated and sward pastures to increase the nitrate-nitrogen content of the soil with a resultant improvement in yield and protein content of the grass component again proved beneficial. In a 1950 planting of alternate rows of lucerne and green panic in which the grass invaded the lucerne in 1952, a gain of 82 per cent. was obtained over adjacent rows of pure green panic. Even in the first year of establishment of a lucerne-green panic sward, a gain of 2 tons dry hay per acre was obtained over an adjacent sward of green panic yielding 1.78 tons of dry hay per acre. Cultivated pure green panic in 42 in. row spacing outyielded the sward of this species by 1.11 tons dry material per acre.

An outstanding feature of the grazing trials of new strains that have shown promise for some years in the nursery was the superior yields of elephant grass Q2940 at each grazing; the total yield for the season was 70.3 tons green matter per acre. The optimum period between grazings of this species to obtain palatable feed appears to be 4-6 weeks in summer; otherwise growth slows down and becomes very stalky. In the second year of comparison of strains of green panic, buffel and Rhodes grass under grazing conditions, C.G.48 Rhodes grass produced the highest yield of green matter—9.14 tons per acre. As the cattle have shown preference for this strain it may prove to be valuable for the district, and enlarged pure seed multiplication plots have been established to allow more comprehensive testing. Buffel grass type D again performed well in this trial and seed multiplictation has now reached small-scale commercial production from seed supplied by the Station.

HCN Investigations.

African Star Grass.—Although good growth was obtained in the plot of this species being grown for grazing by cows to test the possibility of HCN poisoning killing the animals, no losses were experienced. In fact, no ill effects have been observed over a 3-year period although an HCN level of 63 mg./100 grams green material has been recorded.

Sorghum almum.—In view of the ability of this species to produce material of high HCN content and its tendency to rhizomatous habit of root development, investigations were continued to ascertain methods of eradication. Cultural treatments were unsuccessful, but spraying with TCA at a strength of 1 lb. in one gallon of water proved to be an efficient method.

Grass Seed Harvesting.

Green Panic.—Investigations of various aspects of harvesting seed of this species were continued and sufficient progress has been obtained to indicate that the following factors are of importance in obtaining high quality seed:—stage of maturation and moisture content of the seed at harvesting; cleaning of the seed; and storage conditions. Investigations of all of these factors are continuing.

Buffel grass.—Harvesting techniques for this species were further studied. So far, the most satisfactory method for obtaining seed of high quality consists of using a suitable screen and collecting trough mounted on the front of a truck. Roughly 60 per cent. of the potential yield is harvested by this method. A stripper patterned on the old wheat stripper-harvester collects a higher yield but the quality is lower than in that obtained with the screen. No success was obtained in removing trash from this seed with a blower-grader, but definite prospects of improved cleaning and handling are indicated by initial tests with a hammer mill.

AYR.

In the second half of 1954 scattered light rains were received, with effective falls in October and November giving a total precipitation of 6.18 in. The "wet season" was delayed until mid-January and lasted until the end of March and during this period 38.38 in. of rain were received. Temperatures did not vary much from October to the end of May, when following a most unseasonable burst of torrential rain totalling 13.95 in. in three days, a drop of 20°F. was recorded.

General.

Experiments to determine suitable crops for the Burdekin Delta have been continued and sound practices for maize, cotton and sunflower production have been evolved. Investigations with several varieties of rice have been conducted in conjunction with larger experiments on the Clare Plots. The results indicate that yields ranging from 2,000 to 6,000 lb. per acre can be readily obtained under experimental conditions. The study of irrigated pastures and beef fattening potentialities has yielded valuable information under the rather atypical weather conditions this year. Special attention has been directed to seed production of tropical grazing legumes, and techniques for machine harvesting of centro, glycine and stylo have been developed.

Facilities have been provided for Soil Chemists and Entomologists.

Crops.

Cotton.—It was again shown that planting as soon as possible after the wet season produced the best cotton yields. The highest yield was 1,563 lb. and the seven varieties tested averaged 1,073 lb. of seed cotton per acre. The autumn-planted crop produced less than 950 lb. per acre. Cotton growing has been extended to some large areas in the surrounding district and a report which incorporates the Experiment Station's results has been published in the *Queensland Agricultural Journal.*

Maize.—Fertilizer and varietal trials were conducted on both April and August planted maize. Under irrigation a starter fertilizer of 1 to 2 cwt. of 10:8:8 composition is recommended. For high yields, side-dressings of 1-2 cwt. of sulphate of ammonia when the plants are 12-15 in. high, and if necessary a further 1 cwt. at pre-flowering stage, are required on the lighter soils of the Burdekin Delta. Plantings immediately after the wet season are more profitable and require less irrigation water. Eight hybrid varieties were tested and the results confirmed previous findings that Queensland hybrids give higher yields than early-maturing southern selections. The Q719 hybrid produced 100 bus. of shelled grain per acre.

Sunflowers.—The Jupiter and Polestar varieties yielded satisfactorily, the former producing 1,688 lb. of threshed seed per acre, with an oil content of 34.9 per cent. A plant spacing experiment showed that 8 in. spacing between plants in rows spaced 42 in. produced taller plants with smaller heads than 15 in. spacings. Yields were lowered by either increasing the plant spacing beyond 15 in. or leaving the rows unthinned.

Wheat.—In a wheat varietal trial embracing eight of the earlier maturing types, Spica produced the highest yield—38.4 bus. per acre. The earliest variety reached maturity in 101 days from planting on May 27.

Miscellaneous.—Experiments with oats, barley, linseed, soybeans, rice and safflower are in progress.

Pastures and Stock.

Some 70 head of young Shorthorn steers have been maintained on the Station to permit a maximum grazing rate on the five irrigated pasture mixtures. During the November-December period grazing was continued at a stocking rate of three beasts per acre to control growth of the pastures, and although the rate was reduced considerably in periods of lower pasture vigour, overall cattle weight gains have been satisfactory. The excessively wet conditions of May, 1955, preceded by high-intensity grazing, caused a decline in the late productivity of the summer species. The para grass + centro mixture has again shown superiority over the guinea grass mixtures. Consistently greater weight gains have been shown by animals grazing mixtures containing centro as against those having stylo as the legume component. The study of changes in botanical composition under grazing is being continued, and during the year a study of chemical composition of the pastures was initiated.

Horticulture.

Pineapples.—A heavy summer crop of pineapples was obtained but the preceding winter harvest was small. The total production of fruit was approximately 1,000 cases. Weed control, using PCP and oil sprays, has been successful. Combinations varied throughout the

year from 10-20 lb. PCP and 2 gal. oil per 100 gal. of water in winter, to 10 lb. PCP and 6 gal. oil per 100 gal. of water for summer spraying. Fertilizer and flower induction experiments are in progress.

Bananas.—Several varieties of bananas have been established, and a time-of-planting trial with plantings in September, December and May was commenced.

French Beans.—Mother seed of Brown Beauty beans was grown on 1.3 acres.

MILLAROO AND CLARE.

General.

Developmental work at the new Millaroo Station has included clearing, fencing and preparation of land and irrigation facilities. The building programme will be well advanced during the later part of 1955. Experimental crops including maize, cotton, wheat and safflower were sown on the levee soil type.

At the Clare Plots observations on pasture establishment on various soil groups have been continued and a para grass + centro mixture has been grazed at the rate of one beast per acre during the year.

Two areas of Prelude rice were grown under swamp conditions following a late-December planting. Harvesting could have been completed in late April, but rain delayed this operation until May 20 and although lodging was severe and some grain was shed the yield exceeded 29 cwt. per acre. Irrigation water requirement was approximately 48 in., but seepage was high and greater efficiency could be obtained in larger areas. There appear to be no insurmountable difficulties in the production of rice in this area, but varietal testing is necessary. Prelude has outyielded others tested but it tends to lodge. The results of various preliminary trials at Clare will be valuable for establishment of the wide experimental programme which will in future be centred at Millaroo.

KAIRI.

Seasonal conditions differed somewhat from normal in that after a very wet autumn the winter months of 1954 were milder and the rainfall was more evenly distributed. The expected November-December storms were completely lacking and the "wet season" rains, usually of the steady monsoonal type, were interspersed with heavy storm downpours. Consequently, winter crops and pastures made good growth but summer crop sowings had to be delayed beyond the optimum planting time. Growing conditions for the summer crops were, however, generally favourable.

Crops.

Maize (1953-54 *Crop*).—As anticipated in the last Annual Report the maize crops produced well, the mean yield per acre for the Station being 22.79 cwt. of sound grain, dried to 14 per cent. moisture. In the main rotation series, yields of 23.97 and 21.99 cwt. per acre respectively were harvested from maize in the first and third years after pasture leys. The yields obtained compared more than favourably with those produced on areas under maize every year on adjoining farms.

In a weed control experiment testing various compounds of 2,4-D in both pre-and post-emergence sprayings of each, no better final results were obtained than by early inter-row cultivation embracing slight hilling up of the rows to smother weeds.

In experiments combining plant spacings of 12 and 16 in. in rows spaced 42 in. apart and side-dressings of sulphate of ammonia at 100 and 200 lb. per acre when the plants were either 15 or 30 in. tall, closer spacing increased yields more than the fertilizer. The 12 in. spacing responded more than the 16 in. to the fertilizer, particularly in the first year after pasture, where a side-dressing of 100 lb. sulphate of ammonia when the plants were 15 in. tall and again when they were 30 in. produced a gain of 8.1 bus. per acre compared with no fertilizer.

In a strain trial testing the merits of Durum—the type of maize grown on the Experiment Station—and the standard Atherton Tableland Dent, the mean yield of three Durum strains was 63.7 bus. per acre, as compared with 58.0 bus. from three representative strains of Tableland Dent. The highest yielding strain of each type produced respectively 66.6 and 63.9 bus. per acre.

Maize (1954-55 *Crop*).—Prospects for the current season's crop are not as bright as last year's, due mainly to late planting. An average crop is anticipated, however, and the various experiments should provide some indicative results.

Oats.—Experiments with oats during the winter of 1954 were affected by the incidence of crown rust (*Puccinia corona*), which developed under the milder temperatures and wetter conditions than normally prevail. In the oat varietal trial, Vicland and Garry failed to produce hay due to crown rust, whereas B.V.H. 1982, Bovah and Klein produced respectively 3.2, 2.7, and 2 tons hay per acre.

The amounts of grazing obtained in an oat varietal grazing trial are summarised in Table 2.

TABLE 2.

OAT VARIETAL GRAZING TRIAL.

Variety.	Number of Grazings.	Total Growth Green Fodder (Tons/acre).	Amount Consumed in Grazing by Dairy Herd. (Tons/acre).
Vicland* ..	2	6·8	4·6
Bovah	3	13·3	8·6
Garry*	3	·85	6·3
Klein	3	14·7	8·8

* Affected by crown rust.

In a time-of-planting experiment, comprising Vicland and Bovah, Vicland was again affected by crown rust, Bovah being resistant. The results obtained are presented in Table 3.

TABLE 3.

OATS TIME-OF-PLANTING TRIAL.

Variety.	Number of Grazings.	Total Growth Green Fodder (Tons/acre).	Amount Consumed When Grazed by Dairy Herd. (Tons/acre).
Vicland—			
April sowing	2	4·8	4·4
Bovah—			
April sowing	3	10·2	8·8
Vicland—			
May sowing ..	3	3·2	3·0
Bovah—			
May sowing ..	3	5·6	5·1
Vicland—			
June sowing..	2	1·2	1·0
Bovah—			
June sowing..	3	4·7	3·8

In a weed control experiment in oats, a pre-emergence spraying of 2 lb. acid equivalent per acre of various compounds and proprietary formulations of 2,4-D, weed population was reduced by 50 per cent. or better over the whole growing season. Unfortunately, the variety treated, Garry, was so badly affected by crown rust that no indicative differences between treatments were reflected in the yields.

Wheat.—In view of the success in previous seasons of the dual-purpose, rust-resistant variety Lawrence, a trial was conducted to ascertain the best time of planting under Atherton Tableland conditions. Yields obtained from March, April, May, and June plantings were respectively 2.5, 2.3, 1.9, and 1.1 tons of hay per acre.

Miscellaneous.—Legume trials showed that mung bean (*Phaseolus mungo*) was most efficient in suppressing dense summer weed growth. Cristaudo, Q3147 and Q3134 cowpeas were also valuable as green manures and Cristaudo produced up to 8 tons per acre.

Testing of fodder canes was continued. Co 301, Q50, and China have been released for general use, and planting material is produced for district farmers. Small areas for pig-feeding purposes yielded 63, 52, and 45 tons per acre respectively.

Experiments with lucerne include testing of various strains of inoculum and the influence of fertilizers and trace elements on production.

Common arrowroot and an Indian variety have been grown for pig feeding and for distribution of planting material.

Small areas of tea and coffee are being maintained.

Pastures.

Legumes.—*Glycine javanica* seed production was continued and mixed pastures were established. Pure stands of this legume are valuable for pig grazing.

Grasses.—Ample pastures were available during the year. In a newly established nursery *Panicum maximum* var. *coloratum* Q2983 was most promising during its early growth, while Q1006 has done best of the buffel grasses.

Grass-Lucerne Mixtures.—Better weed control has resulted from oversowing Rhodes grass in the first year of establishment of the lucerne component as compared with oversowing in the second year. In the experiments conducted to ascertain the best technique for establishing either Rhodes grass or green panic grass in lucerne, discing of the lucerne at the earliest opportunity after commencement of the wet season whilst the soil is moist, and then oversowing the grass, has given the most promising results.

Plate 1.—The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) Inspecting Grain Sorghum at Biloela in Company with the Station Manager (Mr. J. Stevens).

Plate 2.—An Irrigated Area of Prelude Rice on Clare Exploratory Plots, Burdekin Valley.

HORTICULTURE BRANCH.

Dr. S. A. Trout, Director of Agriculture.

Weather conditions during the year were most unusual. In spring and early summer, good and evenly distributed rains fell in all the more important horticultural districts. A relatively dry spell in December and January checked the development of deciduous fruits, but relief rains fell at the end of January. Since then, frequent rains have fallen and the skies have been overcast for much of the time. In the Central Queensland and Burnett districts, the summer rains were accompanied by two cyclones which caused havoc in some horticultural crops.

The combination of difficult seasonal conditions and variable returns to the grower for fruit and vegetables has therefore created an element of uncertainty in the horticultural industry.

The demand for soil conservation services increases each year, particularly from growers who are establishing new areas of tree or plantation crops. This indicates a better appreciation of the complexities in management of fruit and vegetable crops.

PINEAPPLES.

The pineapple remains the most important horticultural crop in Queensland and the acreage under crop is stable at approximately 11,000 acres. A record summer crop of 1,758,300 cases was harvested in 1955, of which 1,423,960 cases were processed.

Most crop management practices are now standardised, but a recent examination of plant spacing in commercial plantations suggests that under some conditions the usual spacing may not be the optimum for the crop. This problem has been investigated at the Maroochy Experiment Station and the data so far obtained suggest that, if the number of plants per acre is increased with a plant spacing of 9 in. in a row as against the usual 12 in., yields in the plant crop are substantially increased. The issue will, however, be determined by the behaviour of the ratoon crops in the experimental areas.

PCP (sodium pentachlorphenate) has revolutionized weed control practices in pineapple plantations since its introduction some four years ago. Some workers are, however, allergic to the chemical. Great interest is therefore being taken in current investigations on CMU (3-parachlorphenyl dimethyl urea), an alternative weedicide which at the rate of 4 lb. per acre has given results at least equivalent to normal PCP sprays. More information is needed, however, on possible adverse effects in the pineapple crop before commercial application can be recommended.

The application of nitrogen to the pineapple plant by means of foliage sprays containing urea is being investigated at several centres. Where the whole of the nitrogen requirement of the plant is supplied in the form of urea, growth is not appreciably different from that obtained with standard fertilizers containing nitrogen in the form of sulphate of ammonia. The leaves, however, lack the normal colour and size which are generally associated with vigour and potentially high yields. A great deal more information is required on the physiology of nitrogen nutrition before foliage sprays containing urea can be recommended.

The value of high concentrations (100 parts per million) of ANA (alpha naphthalene acetic acid) sprays applied to the developing fruit for delaying the time of maturity was demonstrated on a commercial scale during the year when growers had to spread the crop in order to ease the pressure on canneries during the peak of the summer crop. Indiscriminate applications of the spray may cause suckers to flower prematurely and thus disrupt the future crop cycle.

Frost Prevention.

Further investigations in conjunction with officers of the C.S.I.R.O. Section of Meteorological Physics have been conducted at the Beerwah farm of the Committee of Direction of Fruit Marketing in order to determine the efficiency of oil burners for raising the air temperature of pineapple plantations when frosts occur. The experiments were concerned mainly with heater spacing, oil burning rate and heat conductance in the soil. Unfortunately, dull and wet conditions precluded much detailed investigational work. It was found that the heat output of the burner was doubled by removing the damper and that spacing of heaters to take advantage of the prevailing westerly wind drift gave a greater degree of protection. The large number of heaters (200 per acre) required to minimise frost losses in pineapple plantations, together with the cost of fuel and labour, make heating a doubtful economic frost prevention method. The 1954 results confirmed previous findings that the upper layers of the soil contain a large reservoir of heat. The most practical method of minimising frost losses appears to be the conservation of heat in the soil and one way of doing this is to keep the soil moist and compact.

Black Heart.

Black heart is still a major problem in the marketing of winter pineapples and wastage in 1954 under very cold and cloudy weather was particularly high. In overseas experiments parachlorphenoxyacetic acid (PCPA) sprays applied to developing fruit have delayed maturity and reduced internal discolouration. Spray concentrations of PCPA varying from 400 to 800 ppm. were applied to a winter crop of pineapples grown at Beerwah at intervals of up to nine weeks before the anticipated time of harvesting. The PCPA sprays delayed fruit maturity but had no effect on black heart wastage.

BANANAS.

Favourable growing conditions during the year followed the reconstruction of plantations in February and July, 1954, when virtually all maturing plants were cut back by cyclones and new followers had to be set to take their place. This had the most unusual effect of glutting the market with first-class fruit during the autumn months, when supplies are normally short.

Plantings during the past two years show an increase over the previous four years and the area under crop now stands at 15,889 acres. The present depressed market for good quality fruit is likely to retard further development in areas which are distant from the principal markets.

The Banana Industry Protection Board met regularly during the year to review disease control measures and other factors affecting the industry. Bunchy top, which had receded to a very low level in 1953-54, showed a slight increase during the year, but its incidence is still extremely low. A serious outbreak of the disease was, however, recorded at Innisfail and a special Order in Council was gazetted to enable the situation to be handled.

Arsenical sprays have been widely used for weed control in banana plantations but they are objectionable to handle. Alternative weedicides are under investigation and experimental results suggest that PCP might be a useful substitute for arsenic. Costs of treatment are much the same. A formulation containing 5 lb. PCP and 2 gal. oil emulsion has given satisfactory results.

Recent work indicates that plastic covers improve winter fruit quality to a greater extent than hessian covers in bunches which are not exposed to the sun. If they are used on well foliaged plants the risk of sunburn damage is not excessive. It is unlikely that plastic covers will replace hessian covers, for both have a place in plantation management depending on the condition of the individual plant.

Queensland pioneered the "one bunch, one sucker" system of plantation management, which involves the removal of surplus suckers as soon as they appear above ground and the setting of a single deep follower in early summer for the ratoon crop. The effect of unwanted suckers on the growth of the parent plant and the size of the bunch has been investigated at the Maroochy Experiment Station. The results show that such suckers not only slow down the growth of the parent plant but also adversely affect the size of the bunch and sometimes the quality of the fruit.

Waxing.

Further experimental work has been undertaken to determine the efficiency of wax emulsion dips for extending the marketable life of bananas. A more natural coating has been obtained by using a commercial preparation of paraffin and micro-crystalline waxes diluted with three parts of water. In order to determine whether bananas grown in North Queensland could be treated

prior to consignment, railed satisfactorily to Brisbane for ripening and marketed in sound condition, a series of experiments was conducted during the summer months. The bananas were subjected to a very severe test by railing them back to Cairns after ripening in Brisbane. All treated lots arrived back in Cairns in a sound condition, while untreated lots were over-ripe. It has been found that wax dipping either before or after colouring doubles the marketable life of bananas and enables fruit to be consigned to distant parts of Queensland in a sound condition during the summer months. In commercial practice the packed cases are dipped in the emulsion and the cost of treatment is relatively small. Most country towns are now demanding waxed bananas and waxing treatment has now become an established commercial practice. Some further experimental work is necessary to determine the various properties of commercial preparations and to obtain an emulsion which is very stable in commercial use.

DECIDUOUS FRUITS.

The apple is the most important of the deciduous fruits grown in Queensland and has the greatest prospects for expansion. This is due partly to the earliness of fruits grown in upland orchards in southern Queensland and partly to the extension of cold store facilities during recent years. The total area under deciduous fruits now stands at 14,800 acres and estimated production for the year is:—apples, 612,000 bus. cases; pears, 53,000; plums, 103,000; peaches, 81,000 and apricots, 14,000 bus. cases.

ANA sprays have been used for many years to reduce pre-harvest drop in some varieties of apples, such as Gravenstein, but the results vary from season to season. In 1954-55, 2,4,5—TP (2,4,5—trichlorphenoxy propionic acid) was tested as a possible substitute and appears to be more reliable than ANA for orchard use.

There is a considerable market premium for early varieties of peaches such as High's Early Canada and Mayflower. These varieties, following mild weather in June-August, tend to shed their buds and bear a negligible crop. DNCHP (dinitro-ortho-cyclo-hexyl-phenol) when applied some weeks before the anticipated time of flowering appears to reduce bud shedding, and the current year's work was concerned mainly with defining treatment schedules more precisely. Present indications are that a spray concentration of 0.06 per cent. DNCHP applied four weeks before the expected time of flowering will produce a normal crop and at the same time hasten fruit maturity by approximately one week.

The performance of replant orchards in the Stanthorpe district is reputed to be inferior to that of orchards established on virgin ground. Trials have therefore been established during the past year which may shed some light on the problem. The investigations will assess the nitrogen, phosphorus and potash requirements of apple trees, the trace element needs of young trees, and cultural measures designed to improve the structure of the soil.

Storage of Apples.

Although a number of new cool stores are not operating in the Granite Belt, all stores in 1955 were filled to capacity. The quantity of Granny Smith and Delicious apples in store by the end of May, 1955, was 203,800 bus. cases. Further trials were conducted to determine the optimum stage of maturity of Granny Smith and Delicious apples for long storage and the effect of controlled atmosphere storage and skin coatings on the keeping quality of Granny Smith apples. Results confirmed those obtained in 1953, which indicated that the optimum picking time of Delicious apples was during the last week in February and the first week in March and that fruit from old trees was of better keeping quality than fruit from young trees. There was considerable variation in keeping quality between fruit from the different orchards and this could not be explained in terms of maturity or tree age. The optimum picking maturity for the Granny Smith variety was again from the end of March to the middle of April. The same variation in keeping quality in regard to tree age and orchards existed as in the Delicious variety.

In an atmosphere containing 10 per cent. oxygen and 2 per cent. carbon dioxide, Granny Smith apples were kept in a sound and marketable condition until mid-December at 34°F. and had less than 1 per cent. wastage after an additional 10 days at atmospheric temperatures. In comparison, fruit in air storage had terminated its cool storage life by the end of October.

Increased susceptibility of Granny Smith apples to superficial scald wastage, which has been a feature of previous experiments with controlled atmospheres, has been overcome by picking the fruit later and reducing the concentration of carbon dioxide in the storage atmosphere. If these results can be substantiated over several seasons, then commercial application will follow. Although some reduction in breakdown was obtained with skin coatings, this dipping treatment was not as effective as storage in controlled atmospheres.

Cool Storage of Plums and Peaches.

Exploratory trials with plums and peaches were commenced in Stanthorpe in 1954 to determine the stage of maturity at which these fruits should be picked for storage. The storage life of plums at an average temperature of 34°F. varied from 1 to 3 weeks and that of peaches from 2 to 3 weeks, depending on the variety. The storage life of peaches was increased by one week by delaying the cool storage for two days.

GRAPES.

There has been little change in the area under grapes at Stanthorpe and in the south-west, but increased plantings have been made in coastal southern Queensland. The present acreage is 2,880 acres and production during the 1954-55 season is estimated at 200,000 half-bushel cases.

Deficiencies of zinc and magnesium were apparent in many Stanthorpe vineyards this season. Neither of these deficiencies is easy to correct, but good control of zinc deficiency has been obtained in experiments at Stanthorpe by swabbing the tips of severed canes at the time of pruning with a solution of 1 lb. of zinc sulphate in 2 gallons of water.

The experimental vineyard at Severnlea continues to make progress and the cropping potential of vines on different phylloxera-resistant stocks will become apparent during the next few years. Some of the stocks which were introduced to the district 30 years ago as a precautionary measure against a possible outbreak of phylloxera have proved of horticultural value on shy-bearing varieties, such as Waltham Cross and Purple Cornichon, because of the vigour which they impart to the vines. A recent survey indicates that approximately 75 per cent. of commercial vines of these two varieties are now worked on resistant stocks.

CITRUS.

The year has been a very mixed one for citrus growers. In spring, the trees set an excellent crop in all districts but cyclonic winds and heavy rain have been responsible for a considerable amount of rind blemish in the harvested fruit. At Howard-Burrum, flood rains in March caused a great deal of damage not only to the standing crop but also to the trees themselves. Nevertheless, the total crop for the State is still above average and should reach approximately 600,000 bushel cases in 1955.

Two important problems facing the industry are (*a*) increasing the production of mandarin varieties which thrive in subtropical latitudes; and (*b*) determining the best stock-scion combinations for replant orchards.

A collection of mandarin varieties has been established at Lawes and some should come into bearing during the coming season. From this material it is hoped to obtain new varieties which will extend the marketing period of this fruit and be better suited for production than some of the commercial types being grown at present.

Stock-scion investigations have been hampered by lack of facilities for propagating trees but this has been remedied by the establishment of a nursery at Newtown, near Maryborough, with financial assistance from the Citrus Sectional Group Committee of the Committee of Direction of Fruit Marketing. The nursery is already well equipped and contains a series of the recognised stocks together with several others of experimental interest.

One of the most significant developments in the Gayndah district is the adoption of permanent overhead spray systems by many growers. Without irrigation, any form of non-tillage in the orchard carries with it a risk of excessive competition between the sod and the trees for available moisture. With irrigation it is

practicable to intensify work on plant types which may be suitable as permanent cover crops; of the species included in trials at Gayndah, Irrigation white clover has proved the most satisfactory.

Colouring.

A survey of growers' methods of colouring fruit artifically has shown considerable variability in temperature, humidity and gas concentration in the ripening rooms. These factors have been investigated in a series of experiments conducted in the Gayndah district, in which a plastic tent has been used to cover the cases during colouring. This method seems very satisfactory and overcomes the difficulty of erecting permanent colouring rooms.

PAPAWS.

The area under papaws in 1954 was, 1,476 acres, from which 330,627 bus. cases were harvested. Departmental interests in the crop is concerned mainly with the production of varieties and strains suitable for the more important papaw districts. The work includes the testing of introduced types, the production of pure lines from local material, and the development of hybrids from these pure lines. Of the introduced types, Hortus Gold from South Africa is perhaps the most promising because the crop matures early. It is therefore suitable for winter and early spring markets which are usually under-supplied with good quality fruit.

In varietal trials at the Redlands Experiment Station and the Maroochy Experiment Station, hybrids such as No. 5 (Bettina 100A x Petersen 170) continue to show promise, and consideration must shortly be given to the production of seed for commercial use.

Ripe fruit rots have not been so pronounced this year and this has to some extent hampered the search for parental material with high resistance to these diseases. However, one line developed from a Sunnybank selection has been virtually free from fruit rot and may prove useful.

Irregular setting is a characteristic of the papaw and is accentuated by adverse climatic conditions. Blossom drop is most pronounced in the early summer flowers, which mature fruit in autum and early winter. Methods of improving setting at this time of the year are being studied at the Maroochy Experiment Station in an irrigated crop. In this project, it will be practicable to examine the influence of hormones such as 2,4-D on setting when conditions are unfavourable for pollination. If such materials prove effective in the papaw the economic gains to the grower should be considerable.

STRAWBERRIES.

The 1954 strawberry crop, though far from satisfactory in the early stages of growth, improved a great deal later in the season. Although the June-July berries were of indifferent quality, the overall returns for the season were up to average standard. Prospects for 1955 are much better; dry weather in December and January permitted effective cultivation before planting, and the crops were established on schedule with good planting material. The area under crop remains fairly constant at about 150 acres and no great expansion can be visualised in a crop which requires so much labour for harvesting.

A series of rather indifferent seasons has led many growers to believe that the plant type in the variety Phenomenal is deteriorating. Such deterioration, apart from that caused by the inroads of virus and other diseases, is unlikely to take place in the strawberry unless seedling contamination occurs in the runner beds. However, in order to clarify the position, clonal selections made some years ago have been supplemented with material from a number of commercial crops and the several lines will be increased sufficiently for the establishment of comparative trials next year.

Work has also been initiated on the nutritional requirements of the strawberry plant, as it is some time since current fertilizer recommendations were rigorously checked. This project should provide information of value to the industry, particularly in regard to the red-brown loams on which a substantial part of the Queensland crop is grown.

Although Phenomenal is a very good strawberry, it has limitations, particularly for processing. Several varieties have therefore been imported from America for observation; these are now undergoing rigorous tests at Canberra prior to planting in order to ensure the exclusion of virus diseases.

During the 1954 season a survey was made of grower practices in harvesting, handling and packing in order to determine what methods could be used to improve the quality of berries delivered to the factory. A premium is paid for strawberries of canning quality, as factories prefer this type of fruit to jam grade. This survey indicates that berries should be de-stemmed at the time of picking, allowed to dry in cool sheltered places, and delivered to the factory within 24 hours of harvesting in containers not more than half-full. These practices will need to be implemented by growers during 1955, as abnormally wet and dull conditions have been experienced during this growing season.

MISCELLANEOUS FRUITS.

Avocadoes.

Interest in the avocado crop continues to grow and the demand for grafted trees far exceeds the available supply. Propagation problems have now been successfully overcome and several nurserymen practice the herbaceous bark-graft for autumn-worked trees.

A collection of stock and scion material built up at the Redlands Experiment Station should provide sufficient wood to meet the anticipated future nursery demand. The best stock-scion combinations are now being propagated at the Newtown nursery and plantings of 1 acre pilot plots should begin in 1956.

There is a keen demand on local and interstate markets for avocadoes of good eating quality, but many of the types now marketed are either picked too immature or harvested from seedling trees of variable character. Maturity tests are therefore being conducted on the main varieties of avocadoes grown in Queensland and the quality of seedling types is being assessed. Three of the 12 samples so far submitted by growers conform to the requirements laid down by the Avocado Advisory Committee and steps are being taken to propagate these types. The main outlet at present for avocadoes is on the fresh fruit market, but there may be other ways of popularising this fruit as a sandwich spread. Sixteen formulations containing avocado as the main constituent were prepared in the Branch laboratory and kept in a frozen condition for over 12 months. The majority of these were very palatable and of good colour after thawing and remained in good condition for several weeks at approximately 40°F.

Passion Fruit.

Recent plantings of passion fruit in the Burnett and other districts have not fulfilled their earlier promise, mainly because of vine losses from Fusarium wilt and recurrent attacks by fruit fly and brown spot. Interest in the crop is therefore lagging behind the market potential for the fruit. The only possible solution to this problem appears to be the isolation of types with sufficient resistance to warrant their use as stock for the commercial variety *edulis*. Selections have been made both in the variety *edulis* and in some non-commercial species which may be of value in the plant improvement programme at Redlands Experiment Station.

Macadamia Nuts.

The Macadamia nut industry remains static and no change is expected until such time as worked trees of uniform type and quality become available and the economics of production are established beyond doubt. The percentage of takes in trials has not been sufficiently high to attract attention from commercial propagators, and grafting methods will have to be investigated more closely.

A considerable amount of information has been compiled during the search for suitable trees among the rough-shelled (*tetraphylla*) and smooth-shelled (*ternifolia*) strains. Ninety samples of Macadamia nuts selected from individual trees throughout the main growing areas have been assessed for their suitability for processing, based on the shape of the nut, percentage of kernel, colour, palatability and keeping quality. The percentage of kernel varied from 25 to 50 while the percentage of nuts of sufficient oil content ranged from 7 to 100. Only five samples of the rough-shelled type and two of the smooth-shelled type had all the desirable requirements for processing.

Storage tests tend to confirm Hawaiian experience that nuts from the *ternifolia* type are of better keeping quality than those from the *tetraphylla* type. Samples of oil are therefore being extracted from the two types in order to determine whether keeping quality can be related to chemical composition.

Plate 1.—Temperature Recording Equipment Used in Frost Prevention Trials.

Plate 2.—Oil Burners in a Pineapple Plantation for Frost Protection.

Plate 3.—Spraying a Pineapple Plantation with PCP for Weed Control.

Plate 4.—Pineapples Planted on the Contour.

Although long-term prospects for the industry depend on the availability of suitable trees yielding nuts of desirable processing quality, it was considered that the possibility of marketing portion of the crop in a processed form should be fully exploited. Therefore, about two tons of nuts from five plantations are being processed commercially and all costs are being assessed.

Ginger.

Interest in ginger growing has been revived in the Buderim district and a consignment of about 25 tons of Chinese ginger was imported in December 1954 to make up for the shortage of local planting material. Unfortunately, the crop harvested was very much below expectations due to the inroads of disease following extremely wet growing conditions.

Laboratory tests have shown that provided the rhizome is harvested some weeks before it develops full size and allowed to ferment slightly during processing, an article free from fibre and possessing the flavour and aroma of imported ginger can be obtained.

Mangoes.

The 1954-55 mango crop was below average mainly because of excessive rains and high winds during the flowering and fruit-setting periods. Nevertheless, the fruit consigned to market in summer was of excellent quality and sold at relatively high prices. The principal demand is for the variety Kensington, which is mainly grown at Bowen. In this area, growers are now treating the trees more as a major crop than as an adjunct to tomatoes, and there is every reason to hope that with the use of fertilizers and occasional irrigation during dry periods, yields and fruit size will be increased.

The possibility of picking mangoes at a more advanced stage of maturity and of delaying ripening with skin coatings has been investigated. The results were not satisfactory, as wax concentrations as low as 3 per cent. completely retarded normal ripening. Stringless mangoes have again proved very suitable for canning and quick freezing, but preparation costs are high because of the necessity to hand-peel.

Figs and Custard Apples.

The minor fruit crops—figs and custard apples—appear to be declining in importance. There is a limited market demand for the fig crop both for the fresh fruit market and for processing. In custard apples the problem is a lack of productivity in the trees; this may be due to unsatisfactory stock material and the problem is now being examined at the Redlands Experiment Station.

TOMATOES.

In 1954 the area under tomatoes was 5,058 acres, from which 671,300 bus. cases were produced. During the winter and early spring months of 1954 supplies from Bowen were adequate to meet the current demand, while spring crops in coastal areas were also reasonably good. Early crops in Stanthorpe encountered stress conditions in November and December and the market was therefore under-supplied until mid-season and late-season plantings came to maturity. Excessive rains, high winds, and lack of sunshine in the February-May periods were responsible for widespread crop failures in coastal districts.

The industry in southern Queensland is very largely dependent on varieties and strains derived from Grosse Lisse. However, no variety can be expected to be equally satisfactory during both autumn and spring and there is an urgent need for a range of varieties suitable for different periods of the year and for specific districts. Work on the tomato crop is therefore mainly concerned with testing varieties from all sources.

Types which may prove useful to the industry are:—(*a*) Stanthorpe—a selection from Rutgers provisionally designated Q5; (*b*) coastal winter crops—hybrids derived from globe and cluster strains such as Q2 and Potentate; (*c*) Burnett—selections from Essary, Garden State and Southland; and (*d*) Bowen—selections from Q3, Lakeland and a nematode-resistant strain provisionally known as 147-3.

Seedbed failures in the tomato crop are not uncommon and it seems inevitable that special measures will ultimately have to be taken to provide the right environment for the young plants. Work on this subject has been initiated at the Redlands Experiment Station.

Following Departmental trials there has been a marked improvement in production in coastal areas through the application of boron and molybdenum to tomato crops. Similar trials in the Stanthorpe district have resulted in substantial increases in yield and it would appear that the general use of boron and molybdenum is warranted on many soils in this area.

BEANS.

In 1954 a smaller acreage of beans was grown and from 4,604 acres a production of 506,930 bus. was harvested. Crops established in midwinter of 1954 suffered from the July cyclone and subsequent sowings matured in the warmer months, when quality beans are difficult to produce. Prospects for 1955 were comparatively good early in the year, for the weather favoured land preparation for autumn and winter plantings. However, late summer and autumn rains were exceptionally heavy and plant growth has therefore been below normal for this time of the year.

Cultural methods for this crop are more or less standardised but the industry needs good, disease-free seed of the commercial variety Brown Beauty. The failure of many crops grown for certification in 1954 has limited the production of certified seed to an area of about 25 acres. This seed is reserved primarily for producers who supply the requirements of the green bean industry in Queensland.

Although Brown Beauty is the most suitable variety for Queensland conditions it is a stringed type and does not meet the requirements for processing. An attempt is therefore being made to breed a stringless bean without losing the inherent disease-resistance of the two parents, Langshaw Beauty and Florida Belle. Prospects for a successful outcome of this work are bright.

LEAF VEGETABLES.

The area under leaf vegetables remains fairly constant at about 2,000 acres yielding approximately 450,000 doz. cauliflowers and cabbages and 190,000 bus. cases of lettuce.

No major production problems were recorded during the spring and early summer months but the position deteriorated in autumn, when land was waterlogged for long periods. Seedbed failures were widespread and losses severe.

The trend towards the ball-head and conical types of cabbage continues throughout the vegetable growing districts. Of the two best-known ball-head types, Enkhuisen Glory and Midseason Market, the former gave the better performance in coastal areas during the wet autumn, presumably because of its greater resistance to disease. Conical varieties of cabbage should not require as much ground space as the larger types and recent work at the Redlands Experiment Station indicates that spacing may be reduced to 12-16 in. in the row without loss of head quality and with a considerable increase in yield.

The introduction of quick-maturing types of cauliflower such as Russia 2A and Snowball has made it possible for growers to supply good heads for market some weeks before the influx of the Phenomenal strains. During the year, Russia 2A proved very susceptible to black rot, while the Snowball types suffered from hollow stem. Trials designed to determine the performance of the better strains in serial plantings from February to August suggest that Phenomenal Early gives the most consistent results in plantings after mid-February. Limited areas of Russia 2A and Snowball may, however, be planted in January and February, for if seasonal conditions are favourable there is a ready market for these varieties early in the year.

The development of warm-weather varieties of lettuce has proved a boon to Queensland growers and the variety Pennlake, which performed well at Redlands Experiment Station in 1953-54, is in demand by growers. Unfortunately, some of the commercial strains available this season were markedly inferior to that grown at the Redlands Experiment Station in the previous year, the plant being variable in type and very prone to bolting.

CUCUMBERS.

One pronounced trend in cucumber crops is the emphasis now placed on early production to meet the requirements of an under-supplied market in spring. Some growers with frost-free slopes in southern Queensland are exploiting this advantage and June-July plantings are increasing. Prolonged wet weather during

1954 encouraged the development of downy mildew, which reduced yields and blemished the fruit. Varieties which stood up to the rigorous conditions at the Redlands Experiment Station were Palmetto and Marketer; the latter has the better quality but the former is more resistant to disease.

Rockmelons were over-supplied during the summer months and quality was below normal owing to unsatisfactory weather conditions as the fruit approached maturity. Varieties with some resistance to downy mildew were therefore at a premium; strain 999 was outstanding in trials at the Redlands Experiment Station in regard to disease resistance and fruit quality.

ROOT CROPS.

Efficient land preparation is the basis of successful production of root crops which are established early in the year and make most of their growth during the summer and autumn. This has been well demonstrated at the Redlands Experiment Station, where an investigation of tillage methods showed that failure to plough deeply in pre-planting tillage operations may be the cause of root constrictions and other abnormalties in the carrot crop.

Several years' trials with beetroot varieties now permit an assessment of individual performances in southern Queensland and current recommendations are Early Wonder for the bunch trade and Detroit Dark Red for the bagged trade.

EXPERIMENT STATIONS.

The Redlands and Maroochy Experiment Stations continue to be the main centres for experimental work on vegetables and plantation crops respectively.

At Redlands, a 5-year project on varietal testing in the more important vegetable crops has terminated, and it is now possible to give much needed attention to some outstanding problems in plant nutrition, soil management and seedling production. Developmental works carried out during the year include the enclosure of recently acquired land and the extension of the irrigation mains to areas now scheduled for cropping.

At the Maroochy Experiment Station the access road has been completed, the packing shed has been equipped with a modern grader to handle the citrus crop, and a second machinery shed is to be erected to house valuable equipment. Steps have also been taken to apply rotational principles to the 12 acres under plantation crops.

Kamerunga Experiment Station provides facilities for investigations on tropical plants of actual and potential importance, and also serves as a source of much of the seed required by nurserymen under the Citrus Budwood and Seed Distribution Scheme. Work on small crops at the Station is hampered by lack of water for irrigation during the spring and early summer months, and the possibility of obtaining additional supplies of water is being investigated.

EXTENSION WORKS.

Extension services have embraced advisory publications, topical articles in grower journals, and farm visits. Relations between the Branch and grower organisations have been strengthened by the formation of advisory committees on pineapples, vegetables, citrus fruits, avocadoes and macadamia nuts.

In conjunction with the Department of Public Instruction, school packing classes in deciduous fruits, tomatoes and citrus fruits have been held in the Stanthorpe, Metropolitan and Maroochy districts respectively. Keen interest was shown by the 579 pupils instructed during 1954-55. The influence of these classes over a number of years is now becoming more and more evident in commercial consignments to market.

Colour movies of "Marketing Faults in Deciduous Fruits", and "Packing Strawberries for Market" have been completed and screened in a number of country centres. Films now in course of preparation include "Banana Culture", "Harvesting, Handling and Packing of Bananas", "Packing of Avocadoes" and "Preparation of Vegetables for Market". Films being revised are "Vegetable Culture" and "Pineapple Culture".

PACKAGING OF FRUITS AND VEGETABLES.

Many fruits and vegetables are now being packaged for retail distribution in bags of plastic or similar composition with moisture-proof and gas-proof properties. Experiments have shown that it is desirable to have a number of small holes in the package to allow the respiratory gases to escape, otherwise injurious effects through lack of ventilation may occur. However, the degree of ventilation required is so small compared with the total surface area of the package that the moisture-proof properties of the bag are still retained. Vegetables such as lettuce, cauliflower, peas and beans deteriorate quickly after harvesting, mainly through wilting. Packaging can reduce water loss to almost negligible proportions and enables vegetables to be kept and marketed in a much fresher condition. In trial, lettuce have been kept for three weeks, beans for two weeks and cabbages and cauliflowers for six weeks at 34°F. and have remained in a fresh, firm, and attractive condition for an additional four days at atmospheric temperatures. In contrast, the unpackaged vegetables were slimy, discoloured, wilted, unattractive, and had a strong unpleasant, hay-like odour.

Pre-packaging should be a very useful adjunct to cool storage for holding vegetables during temporary gluts. It should also facilitate the delivery of vegetables in good condition to distant parts of the State as well as to interstate markets and overseas.

In a somewhat different category is the fibre-board carton which is being tried on a semi-commercial scale in the packaging of citrus fruits. There is likely to be a shortage of softwoods in Queensland for some years to come and the fibre-board carton may be a satisfactory substitute for the wooden case. Following observations on the condition of cartons delivered to the Brisbane market, many improvements have been made by the manufacturers in the design of the carton, but the problem of ventilation to avoid self-heating of the contents requires investigation.

TRANSPORT.

A fan car set being imported from the U.S.A. will be installed in a Queensland railway wagon for trials during the summer season of 1955-56. This equipment consists of a number of fans which operate while the train is in motion, thus enabling consignments to be cooled down during transit. A number of tests will be necessary to determine whether any modifications are required before its commercial application in Queensland can be recommended.

A small lot of packaged lettuce consigned to Longreach in a refrigerated wagon opened up in very much better condition than similar lettuce unpackaged.

Experimental shipments of packaged vegetables to Darwin, Hong Kong and the Philippines are under consideration.

MARKET INSPECTION.

Extremely wet conditions during the year have resulted in mould wastage in stone fruits, grapes and citrus, and colouring burn in oranges. The market has been well supplied with all fruits, with a periodic over-supply of bananas, but vegetables in general have been in very short supply. Prior to the deciduous fruit season, grower meetings were held throughout the Stanthorpe district, when grade standards were thoroughly explained and a movie film showing typical faults in marketing was screened. As a result of these meetings and through the co-operation of the industry there has been a very marked improvement in the standard of deciduous fruits marketed this season and condemnations have been mainly for under-sized fruit.

OVERSEAS EXPORT.

Remunerative local prices, light crops in other States, uncertain overseas markets and the difficulty of obtaining suitable cases have been the factors mainly responsible for small overseas shipments during the past 12 months.

The majority of cases submitted for export have not complied with the Commonwealth Export (Fresh Fruit) Regulations due to discolouration from moulds and mildew. Export requirements for Hollandia and New Guinea are less exacting than for more distant markets and a considerable export trade with these countries is now being developed.

PLANT QUARANTINE.

Plant quarantine inspection on behalf of the Commonwealth Department of Health has had to be intensified to cope with increased bulk imports of timber and the inspection of all wooden containers to prevent the possible introduction of timber pests. New regulations covering the importation of orchids have also increased the work of quarantine officers throughout the State.

SCIENCE BRANCH.

Botany Section: Mr. S. L. Everist, Government Botanist.

Entomology Section: Dr. W. A. McDougall, Chief Entomologist.

Plant Pathology Section: Mr. J. H. Simmonds, Chief Pathologist.

BOTANY SECTION.

During the year the greatest part of the work in the section was devoted to identification of plants from farmers, field officers, other Government departments, both State and Commonwealth, school teachers, school children and home gardeners. These plants included trees, grasses, weeds, suspected poisonous plants and garden plants. Three introduced plants were received which had not previously been found in Queensland. These were *Reseda lutea* (cut-leaved mignonette), *Carduus nutans* (the musk thistle) *and Sisymbrium altissimum* (tumbling mustard).

WEEDS.

More than 500 enquiries on weeds and weed control were dealt with during the year. Enquiries on groundsel-bush (*Baccharis halimifolia*) were particularly numerous as a result of a compulsory scheme to clear this weed from shires north of Brisbane. Clockweed (*Gaura parviflora*) was found on the Mary River, considerably beyond its previously known range. Balloon cottons (*Asclepias fruticosa* and *A. physocarpa*) were unusually plentiful during the year and appear to be spreading outwards from the south-eastern corner of the State.

Close co-operation was maintained with the Stock Routes Co-ordinating Board and the Biological Section of the Department of Public Lands on matters relating to weeds and weed control. In August I attended the first Australian Weed Control Conference at Roseworthy, South Australia, where the whole field of weed control was discussed. It was obvious that much of the weed control work in Australia is empirical and that there is a pressing need for more fundamental research on the plants themselves if there is to be a really scientific approach to weed control.

Brigalow Spraying.

One set of experiments on aerial application of chemicals to brigalow was completed under poor conditions in July but the rest of the winter trials were postponed until 1955 because of the unusually warm, wet weather.

Observations on other experimental blocks may be summarised as follows:—

1951.—Half of the virgin scrub blocks sprayed in April 1951 were burned in February 1955, nearly four years after spraying. No new suckers have yet appeared in this burnt area.

1953-54.—It is still too early to draw definite conclusions from this series of experiments. Defoliation ranged from 25 per cent. to 95 per cent. and was more rapid following November spraying than after March spraying. It was greatest on virgin scrub in the Wandoan-Taroom area and least in stunted suckers in the Tara area.

Indications to date are that oil-based chemicals spread more evenly over an area, penetrate better into the understory and produce more rapid defoliation than those emulsified in water. At the higher rates of application this is less significant than at low rates. Coppice shoots from the stems of defoliated trees were more abundant on water-treated than oil-treated areas, whereas root suckers were more abundant on oil-treated than on water-treated areas.

On suckers eight weeks old when treated in April 1954, 2, 4, 5-T at 1 lb. per acre gave almost complete kill both with ground equipment and with aircraft application. Very few new suckers had appeared 14 months later. At lower rates, aircraft application gave results markedly superior to those obtained with the same chemicals applied with ground equipment. These results indicate that 2,4,5-T can be useful in controlling young suckers after a burn.

Private commercial spraying of brigalow has proceeded during the year, five aircraft companies being engaged on this work. More than 100,000 acres have been treated by this method. All operators used 1 lb. 2,4,5-T acid per acre as the butyl ester dissolved in oil, either diesel distillate or special oils compounded for the purpose. Some failures of earlier sprayings were reported and these are being investigated.

One company is using aircraft to sow seeds of Rhodes grass and green panic grass in sprayed brigalow after defoliation. Early reports indicate that these grasses have grown well even in unburnt brigalow. Expansion of this technique could accelerate considerably the development of the brigalow country.

Eucalypt Control.

Experiments at "Brian Pastures," Gayndah, on the use of hormone herbicides to kill eucalypts were continued. Results were poor. The best kill obtained was 40 per cent. with 1 per cent. 2,4,5-T butyl ester and butoxyethanol ester in dieselene applied to a frill cut round the larger trees or to the freshly cut butts of smaller ones. Treatments with other formulations of 2,4-D and 2,4,5-T in an oil + water emulsion gave 5-20 per cent. kill. Overall spraying of seedling eucalypts with 2,4-D and 2,4,5-T gave only 5-20 per cent. kill. It seems obvious that these particular hormones are not effective with the techniques used in this experiment. Further experiments are planned, using different techniques of application.

Control of Limebush and Tea-tree.

Small-scale tests on limebush (*Eremocitrus glauca*) and black tea-tree (*Melaleuca pubescens*) in the Tara district gave poor results with 2,4-D and 2,4,5-T, but ammonium sulphamate applied dry to freshly cut butts killed the plants and there was no regrowth.

Charleville Turkey Bush.

Following representations from local graziers and at the request of the Department of Public Lands, surveys were made of the distribution and habitat of *Eremophila gilesii*, a small native scrub known as turkey bush in the Charleville-Cunnamulla-Quilpie area. It was found that this plant occurs within a radius of 100 miles from a point on the Paroo River west of Wyandra. Within this area up to 50 per cent. of some individual properties are infested; the carrying capacity has been severely reduced and movement of sheep has been restricted. Observations suggest that the plant is an early coloniser of bare ground in mulga country. There appears to have been a marked increase following drought years of the mid-1940's and a smaller increase following the fires of 1951. In some places overgrazing also has been a factor in its spread. Native insects were found attacking some plants. Observation plots were established to study the growth and development of the plant. As yet no control measures can be suggested except mechanical removal.

POISONOUS PLANTS.

In addition to botanical specimens, 121 samples of stomach contents were examined for the presence of suspected poisonous plants. Authenticated cases of human poisoning by angel's trumpets (*Datura arborea* and *D. metel*), *Euphorbia tirucalli, Synadenium grantii* and arum lily (*Zantedischia aethiopica*) were reported during the year. All these are commonly cultivated garden plants. Considerable interest was shown in *Alstonia constricta*, a native poisonous plant known as bitter-bark or quinine tree. Work by C.S.I.R.O. showed that the valuable drug reserpine could be extracted from the roots of this species, and there were many enquiries about possible sources of supply. If this plant is to be utilized it may be necessary to take steps to conserve existing stands and to bring the plant into cultivation.

BOTANICAL EXPLORATION AND TAXONOMY.

There are several areas in Queensland which are little known botanically. One such area—the Pentland-Croydon-Einasleigh area—was examined during the year. Over 400 different plants were collected, including at least 12 new species. Rain-forest areas in North Queensland and in the Bunya Mountains were also explored.

Taxonomic studies of *Melaleuca*, which includes the paper-bark tea-trees, are nearly complete. These important constitutents of the wet coastal lands have always been difficult to identify and their elucidation provides a sound basis for ecological studies of the sandy coastal lands, including the wallum country.

Critical studies were made of the genera *Mesembryanthemum*, *Plectranthus* and *Paspalidium*, as well as miscellaneous grasses and *Cyperaceae*. The native species of *Musa* (native bananas) were studied in conjunction with Dr. N. W. Simmonds, a specialist from Trinidad.

A proposal was put forward for the preparation of a new handbook to the flora of Queensland, a concise illustrated work which could be used by field officers and others to identify the plants native and naturalized in the State. It is anticipated that it will take 15 years to complete.

HERBARIUM AND LIBRARY.

The task of reorganizing the herbarium collections and the library was begun. Sixty-five families were re-arranged in the herbarium. Exchange of specimens with other institutions was continued.

About 400 specimens were received from other institutions for critical examination and identification and approximately the same number sent on loan to overseas institutions for study in connection with Flora Malesiana. Assistance was given to C.S.I.R.O. botanists in identifying more than 1,000 specimens from Australia and New Guinea.

In the library, attention was given to the listing of periodicals so that they can be catalogued. About 110 volumes were bound during the year.

VISITING BOTANISTS.

During the year botanists who visited the herbarium included Prof. H. J. Lam (Leiden, Holland), Prof. W. S. Phillips (Tuscon, Arizona), Dr. Eula Whitehouse (Dallas, Texas), Dr. N. W. Simmonds (Trinidad) and four botanists from Canberra and the Northern Territory.

ENTOMOLOGY SECTION.

The year's work has been one of consolidation, with emphasis on the rounding off of several important projects which have every indication of yielding worthwhile economic results. This has allowed a re-allocation of staff to afford some officers wider field experience, and the stationing of an entomologist at the Bureau of Tropical Agriculture, South Johnstone, to attend to problems in the wet tropics.

With a relatively warm winter and above-average winter and spring rainfalls in 1954, followed by heavy rain during March and a wet autumn, several unusual pest infestations were experienced, and the behaviour of some other species was abnormal. In most instances, however, controls when promptly applied proved adequate, and in general economic losses were not severe.

DECIDUOUS FRUITS.

Codling moth (*Cydia pomonella* (L.)) and the light-brown apple moth (*Tortrix postvittana* (Walk.)) were prevalent in the Stanthorpe district, and damage by the latter was accentuated on some orchards by growers not spraying due to fear of possible lead arsenate residues. Work at the re-opened entomological field station in this district has been concerned with intensified investigations of fruit fly control, spray residues and compatabilities, and improved control schedules in apple and pear orchards. A satisfactory method of substituting DDD for lead arsenate against *T. postvittana* has been evolved. General progress will now allow more detailed studies of mites and pests of other crops such as stone fruits.

In the Pinkenba area the investigation of the root channeller (*Leptops setosus* Lea) in peach orchards is being continued as a long-term effort.

TROPICAL FRUITS.

Field inspections indicate that the current Departmental schedule for the control of banana pests gives reasonable commercial protection; certain deviations therefrom, however, have been the major cause of increased mite activities. Further field trials against the banana weevil borer (*Cosmopolites sordidus* Germ.) have been established.

The "wilt" survey in pineapples was extended during spring to include districts in the southern parts of the State. However, populations of mealy bug (*Dysmicoccus brevipes* (Cockerell)) were not sufficient for worthwhile experimental purposes. This work is now being planned for implementation in some far northern areas. Prompt action was taken to confine a new outbreak of pineapple scale (*Diaspis bromeliae* (Kern.)) at Yatala, near Beenleigh.

CITRUS.

Reports of losses caused by fruit-sucking moths have been received from many districts, and with substantial improvements in the control of other citrus pests, the time is not far distant when attention to the control of these pests must be given high priority. A series of pest control schedules for the various citrus districts is being prepared. Results from the 1953-54 large-scale orchard trials against red scale (*Aonidiella aurantii* (Mask.)) on oranges in the Gayndah district confirmed those of the previous season, and during the past 12 months further trials have been established against this pest on mandarins. Reinfestation by citrus gall wasp (*Eurytoma fellis* Gir.) has again been at a low level, and the belief that a favourable parasite-host balance has been established appears to be verified. Pest infestations on recent trial sites were insufficient to allow satisfactory data to be obtained.

FRUIT FLIES.

Severe and unseasonal attacks by these pests, particularly *Strumeta tryoni* (Frogg.), were recorded mostly from home gardens in many districts including as far west as Charleville. Investigational work has been intensified at Toowoomba, and new data on species distribution and pest behaviour have been collected. Behaviour during laboratory insecticide screening has complicated this phase of study, which is basic to improving commercial control. The first large-scale control trial in the field to give satisfactory technical results has been accomplished; suitable DDT spraying resulted in 92.6 per cent. sound fruit, when only 29 per cent. was obtained from the untreated plots. An article dealing with morphological characters of trypetid larvae, and with a key for identifying larvae of the common Queensland fruit flies, has been prepared for publication. This could be of value to quarantine, and to research workers with these pests in other fields of endeavour.

TOBACCO.

Apart those damaged to a minor extent by locusts and mites, which are limited geographically, few crops were allowed to suffer from the common pests. The tobacco looper (*Plusia argentifera* Guen.), however, was not particularly abundant and the few neglected crops were heavily infested only by leaf miner (*Gnorimoschema operculella* (Zell.)). Investigational activities have been mainly concerned with refinements in nematode (*Meloidogyne* species) control, and a survey of the minor tobacco pests in the south-western districts.

FORESTRY.

Infestations of the European house borer (*Hylotrupes bajulus* L.) in imported prefabricated houses are under constant observation. An insecticide trial to control the cedar shoot borer (*Hypsipyla robusta* (Moore)) has been established in the Imbil area. The possibilities of lessening damage by native rats to young pine plantations in the Yarraman district are being studied; this project is a difficult one, but a solution would be of considerable economic benefit.

LOCUSTS AND GRASSHOPPERS.

Loose hopper swarms reported from the Texas and Inglewood districts were investigated during late October. Seven species, with *Chortoicetes terminifera* (Walk.) predominant, were encountered, but this infestation was considered of little importance as suitable rainfall was responsible for good growth of grasses. In October, flier swarms of the spur-throated locust (*Austracris guttulosa* (Walk.)) entered the tobacco areas at Dimbulah, and the coastal lands at Ingham; shortly afterwards swarms swept across the southern edge of the Atherton Tableland. Economic damage was in general light, and by the end of January the "plague" had disappeared.

NEMATODES.

A State-wide survey of these important plant pests has been initiated, and already many new records have been made. The main economic crops being given attention are tobacco, citrus, bananas, pineapples, and vegetables. Planned investigations in progress include studies of the morphology and physiology of these pests.

VEGETABLES.

The usual potato pests were not prevalent in the field, but some poor dusting at harvest resulted in appreciable losses due to the tuber moth (*Gnorimoschema operculella* (Zell.)). In the main southern areas heavy infestations by a tarsonemid mite reduced many field yields. Screening trial results and some commercial spraying demonstrated that this pest may be controlled by sulphur treatments, or by spraying with 0.05 per cent. dieldrin. Extensive control trials against mites (*Vasates lycopersici* (Massee)) on tomatoes at Bowen and *Tetranychus urticae* Koch in bean fields in the Brisbane area were carried through. Results with the newer materials did not compare favourably with those obtained by using either sulphur or parathion (E605). Again this year a number of trials concerned with the control of the several cabbage pests, including the cabbage white butterfly (*Pieris rapae* (L.)), were concluded. Spraying with 0.025 per cent. endrin was superior to all other treatments except against aphids, for which BHC is required. Parasites of the green vegetable bug (*Nezara viridula* (L.)) were liberated in the Ormiston area.

MISCELLANEOUS FIELD CROPS.

Linseed, although planted in early May, was still flowering in late September, and more than the usual amount of spraying to combat Heliothis was necessary: indifferent results over large areas could be attributed to poor timing and ineffective spray coverage. Experimental plantings of safflower on the Darling Downs met with serious attacks by the aphid *Capitophorus elaeagni* (Del Guercio); adequate insecticide coverage is required if this insect is to be checked in such a tall, leafy crop. The blue oat mite (*Penthaleus major* (Duges)) was recorded as damaging peanuts in the Rockhampton district.

Comprehensive surveys of white grub damage in pastures have been carried out. Investigational work with these pests is progressing, and it is now evident that percentage kills by BHC and aldrin vary considerably with the different species. The ant (*Pheidole ampola* Forel) which damages germinating sorghum and other cereals in parts of the Darling Downs, the Central Highlands and Callide and Dawson areas, is still a problem, and further field trials against this pest have been established. The problem of funnel ants (*Aphaenogaster* species) in pastures has now been made a major project.

The looper *Zermizinga indocilisaris* Walk. defoliated appreciable areas of lucerne; the lucerne leaf roller (*Tortrix divulsana* (Walk.)) was active for some months; and an unusual outbreak of *Nezara viridula* in late January and February damaged legume cover crops, maize sorghum and other cereals. Trial results have demonstrated that DDD, when correctly used, gives a good control of *T. divulsana*.

In southern Queensland the sorghum midge (*Contarinia sorghicola* (Coq.)) damaged crops maturing after mid-January, while in the Central districts late tillers of the mid-season and early heads of the late crops were heavily attacked. Detailed studies of this pest are being continued, and interest is being taken in an imported sorghum reputed to be resistant to midge attack.

The rough bollworm (*Earias heugeli* Rog.) was prevalent in many cotton crops, and further control trials were established. Grass caterpillars (*Psara licarsisalis* (Walk.) and *Prodenia litura* Fabr.) damaged pastures in several districts where suitable spraying was neglected.

MISCELLANEOUS.

Studies of Agromyzid leaf miners have been continued. The policy of publishing the large amount of data on the Coccoidea available in this Department is being implemented. Attacks on *Duboisia* over 80 acres in the Proston district by the hawk moth, *Coenotes eremophilae* Luc., were arrested by using lead arsenate and a sticker. Several rabbit repellants tested in Stanthorpe orchards were found unsatisfactory.

BEEKEEPING.

The number of registered beekeepers (1,111 at March 31) continues to increase, and moderate crops of honey were obtained from the major nectar producing flora. Extension and routine inspectional work covered 61 districts, and attention was given to 7,605 hives in 162 apiaries. American foul brood (*Bacillus larvae* W.) was found in only one colony, and five hives were affected by Nosema disease (*Nosema apis* Zander).

FAUNA AND FLORA CONSERVATION.

The implementation of *The Fauna Conservation Act of* 1952 has proceeded smoothly, and for the first full year of operation 1,194 permits and licenses were issued. Field inspections in connection with kangaroo shooting have been commenced. Complete descriptions of all sanctuaries are now available in an index, and suitable mapping of these is planned. Eight prosecutions for shooting protected fauna were recorded, and eight firearms were confiscated. Seventeen honorary protectors and one honorary ranger were enrolled, and one honorary ranger resigned.

The illegal collection and sale of North Queensland orchids is the subject of an intensive enquiry which has not as yet been finalised.

PLANT PATHOLOGY SECTION.

Following an out-of-season cyclone which struck southern Queensland in mid-July, bringing heavy rains and gale-force winds, an unusual type of foliage injury became evident on cultivated crops and native vegetation alike in coastal districts receiving the full force of the blow. This took the form of a marginal and interveinal necrosis of the leaves, extending to a complete necrosis and defoliation. The symptoms have been attributed to a combination of salt injury and desiccation by high winds.

In the 1955 summer period two further cyclonic disturbances occurred, again associated with heavy rain and wind. Bacterial diseases normally spread by driving rain, such as black rot of crucifers and bacterial blights of bean, were very prevalent in some areas. The wet conditions were conducive to the development of root and stem rots in papaw, while the stresses brought about by the strong wind appeared to be responsible for some unusual developments in banana plants.

CEREALS.

Wheat.

High temperatures and abundant moisture provided ideal conditions for stem rust. While many varieties were severely infected, Lawrence, Celebration, Festival, Spica and Three Seas showed excellent resistance.

Rhizoctonia root rot of wheat occurred in a few plantings but it was relatively inconspicuous in comparison with the previous year even in paddocks with a history of serious infection. The season was noteworthy for higher temperatures and more than average rainfall, and these factors may have been responsible for the difference.

Fusarium crown rot recurred this season, particularly in the Cecil Plains-Brookstead-Jondaryan areas, and caused extensive damage to a wide range of varieties. Affected plants produced either white empty heads or heads with light-weight grain. Field experiments are in progress to determine the relative susceptibilities of 20 varieties, the nutritional relationships and the effect of seed treatment on control.

Sorghum.

A stalk rot of grain sorghum was identified as charcoal rot caused by *Sclerotium bataticola*. The disease occurred in several areas on the Darling Downs, where it caused economic damage. The lodging of the plants as they approach maturity and dry rot in the stem near ground level, with which small black sclerotia are associated, are the characteristic symptoms.

FIELD CROPS.

Onion.

The two onion downy mildew spraying trials have been completed. There was little visual effect noticeable from any of the materials used, but on a yield basis the zineb plots were better than any others. However, the increase in net cash return was not sufficiently great to justify routine spraying.

Cowpea.

Further attention has been given to the stem rot of cowpea. The organism responsible has been identified as a previously undescribed species of *Phytophthora* and data have been collected preliminary to describing this species. Varietal resistance testing has been continued. Two varieties proved outstanding for resistance, namely Blackeye 5 and one at present designated as C521.

Four other cowpea diseases were identified for the first time during the year. These include the rather important Fusarium wilt caused by *F. oxysporum* f. *tracheiphilum*. Preliminary testing of varieties for resistance to this disease has been commenced. Fortunately Blackeye 5 appears to be resistant to this trouble as well as to stem rot. The other diseases referred to are leaf spot (*Helminthosporium vignae*), Verticillium wilt, and leaf, pod and stem spotting caused by *Cladosporium vignae*.

Tobacco.

Another experiment to investigate fungicidal control of blue mould in the field using home made cuprous oxide and zineb was finalised in September. The fungicides were applied every seven days and care was taken to cover both upper and lower leaf surfaces thoroughly. Results, however, were disappointing. It is doubtful whether control of such a disease on a rapidly growing crop such as tobacco is likely to be achieved by any of the known fungicides.

Ginger.

A spectacular outbreak of a disease which has been termed stem rot occurred during the past season in ginger plantations on the Near North Coast. The disease was widespread in plantings made with seed material imported from China, but the local variety has been shown to be equally susceptible. A soft rot in the developing rhizome leads to a decay in the pseudostem, which leans over and finally collapses. Spread in the field is rapid, especially during periods of heavy rainfall. A species of Fusarium was isolated from the diseased ginger and this was subsequently proved to be the causal organism.

DECIDUOUS FRUIT.

Peach.

The spraying trial against brown rot was concluded with little field incidence in any plots. The trees were sampled and the fruit held in cartons for some days, when considerable brown rot developed. A pre-harvest spray was shown to be a definite advantage but the overall control of the disease is by no means yet on a satisfactory basis.

SUBTROPICAL FRUITS.

Passion Fruit.

Further testing of species of *Passiflora* for resistance to Fusarium wilt has been carried out. Three varieties of *P. flavicarpa* which proved highly resistant in glasshouse testing have been used as stocks for *P. edulis* in a field trial. Ungrafted *P. edulis* have already died out, whereas there have been no losses in the grafted vines.

TROPICAL FRUITS.

Banana.

The banana leaf spot (*Cercospora musae* and *Cordana musae*) control work in North Queensland suffered a severe setback by cyclonic weather early in March, when a large proportion of the stools was snapped off or uprooted. One matter of interest which has emerged is that a complete cover spray is of more advantage than regular heart-leaf sprays. This would suggest a rather different manner of infection than that reported overseas. Work on the physiology of the causal organism is being undertaken with the object of obtaining more information on this aspect.

Following the cyclonic disturbances in 1954 and 1955 there have been numerous reports in southern Queensland of unusual symptoms in bananas which could be best attributed to the exceptional weather conditions. The commonest of these related to leaf abnormalities, which ranged from reduction of the leaf blade, with puckering and chlorosis, to rotting of a portion or the whole of the central leaves. Other symptoms took the form of a corm rot, which in some cases was sufficiently serious to reach the growing point and destroy the plant. The suckers were unaffected. At Brookfield, scattered Lady Finger plants developed a premature leaf yellowing and a vascular discolouration not unlike Panama disease. No causal organism could be isolated and the plants, affected during the winter, appeared to recover during the summer months.

VEGETABLES.

Bean.

Further progress has been made in backcrossing the progeny of the California Small White x Brown Beauty cross. Two field trials were conducted in which screening for rust resistance and agronomic type took place. So far, five backcross generations have been raised and a large number of rust-resistant Brown Beauty type lines have been built up. In addition, this programme should provide types resistant to angular leaf spot, anthracnose and bean mosaic. The sorting out of these types is at present in progress.

Tomato.

In recent years, a disease of tomatoes characterised by a stunting of the terminal growth with slight chlorosis and rugosity and a necrotic spotting and shrivelling of the lower leaves has become of increasing importance. It has now been shown to be due to a virus probably related to the potato Y group. This virus is transmitted both mechanically and by aphids. An intensive investigation into all aspects of this disease is at present in progress.

Seedlings.

Laboratory and field investigation of damping-off and pre-emergence rots has greatly enlarged the knowledge of the cause and control of this common source of trouble in seedbed maintenance.

SOIL MICROBIOLOGY.

The main objective in the year's activities has been to obtain effective Rhizobium cultures for all legumes likely to be grown commercially in Queensland.

The position with respect to clovers is now satisfactory. A strain trial on red and white clovers at Ormiston with isolates from various areas in Queensland and elsewhere gave large responses to inoculation with effective strains. Considerable variation was shown between strains isolated from within the one area and also from different areas. Trials at Toogoolawah on red, white, subterranean, and crimson clovers gave marked responses in growth to inoculation. Varietal differences have been shown by subterranean clover in response to inoculation with particular strains of Rhizobium.

More attention is being given to the tropical legumes and a screening trial has just been completed at Coolum. Strains effective on soybean, *Glycine javanica*, puero, centro, *Clitoria ternatea*, *Desmodium uncinatum*, and *Indigofera hirsuta* have been obtained. Responses to inoculation in growth and colour were often quite large, while in other cases the nitrogen content was definitely increased.

A number of cases of reported poor nodulation or poor seedling establishment have been investigated. In some instances the trouble has been shown to be due to nutritional factors, while in others parasitic soil organisms such as *Pythium and Rhizoctonia* appear to be involved.

The distribution of Rhizobium cultures to farmers has been continued. The increase in popularity of sown pastures has brought with it a greatly increased demand for these cultures notwithstanding that commercial preparations are now available.

CHEMICAL LABORATORY.

Dr. M. White, Agricultural Chemist and Biochemist.

The early concept of agricultural chemistry as epitomised by von Liebig just over a century ago was essentially the chemistry of ash constitutions of plants. With the growth of organic chemistry the field was extended to cover the volatile and combustible elements then known to be necessary for life.

This was about the stage agricultural chemistry had reached at the turn of the century, when the formation of a chemical laboratory in the Department of Agriculture and Stock was envisaged.

The laboratory soon encompassed the chosen scope of proximate analysis for soils, waters and plants and then more and more focused attention on the biological aspects of its rapidly expanding activities.

Today the results are clearly reflected in many branches of protection and production. Notable contributions have been made to the knowledge of insufficiency and excess of nutrient disorders in both plants and animals. The suitability of waters for crops and livestock as well as their effects on soils have been studied; land-use maps have been prepared from field surveys; mechanisms of poison action have been examined with a view to remedial treatment; and finally, the assessment of wheat quality by laboratory tests has begun.

These examples show the range now embraced by the term "agricultural chemistry." Other lines of enquiries during the year are recorded in greater detail under the appropriate headings.

BIOCHEMISTRY SECTION.

Copper Deficiency.

Three long-term trials on copper supplementation were continued during the year in association with other Branches.

(*a*) At Yan Yean, in north-western Queensland, to measure the response in terms of wool growth, wool quality and weight increments in sheep following copper supplementation both by oral and by parenteral administration.

(*b*) At Mooloolah, on the Near North Coast, to determine the uptake in pasture and subsequent accumulation in grazing cattle following copper treatments of the soil.

(*c*) At Rocklea Animal Husbandry Farm, to measure the duration of protection and the response in terms of weight increments following parenteral administration of copper to cattle showing low liver copper reserves.

Copper deficiency manifests itself so clearly in the deterioration of fleece that most of the work done with sheep has aimed at curative or ameliorative treatments using wool appearance and liver analyses as indices.

In recent years two complications have arisen: the antagonism to copper of inorganic sulphate and antagonism of molybdenum. Nevertheless, it has been possible to arrive at the following conclusions:

(*a*) Administered copper is exhausted in about three months, irrespective of whether the treatment is orally or by injection.

(*b*) Wool disorders appear in sheep with normal copper reserves if the intakes of molybdenum and sulphate are high.

(*c*) Copper therapy at high rates, or more frequently than otherwise indicated, partly counters (*b*).

Copper inadequacy in cattle has continued as two separate enquiries. The Mooloolah work has shown:

(*a*) That copper losses from topdressed soil are severe and that treatments of not less than 14 lb. of bluestone per acre at least twice a year are necessary if the forage is to be kept at a reasonable copper content.

(*b*) That under these conditions cattle can be maintained in positive balance.

(*c*) That liming with copper treatments favours the establishment of clovers even in the absence of extra phosphate.

(*d*) That the elevated copper status of stock has apparently no effect on liveweight increments. There is evidence that food intake is reduced, but the reason is not obvious.

In the Rocklea experiments, all copper treated stock have given increased values in both circulatory and stored copper. The controls have followed the expected paths. Vital measurements have failed to show any benefit to the treated stock. This is perplexing, and it is being explored using the tentative hypothesis that an antagonistic factor (or factors) is operating and that the deficiency is not frank, but complicated.

Vitamin A in Calves.

The seasonal fluctuation in vitamin A in butter has been followed, using material from 12 districts. The findings will be used to select areas in dairying districts for work on vitamin A in calves. So far the pattern shows variations which might be interpreted as being due to breeds and pastures, but the overall picture will not be clear until the programme is further advanced. Recent work in biochemical and microbiological methods is enabling investigators to dispense with long and expensive bioassays.

Vitamin A for Poultry.

Many specimens of poultry are received by veterinary pathologists at the Animal Research Institute. Livers of those birds for which adequate management data were available were examined for vitamin A. This was done partly to gauge the reserve levels for birds of different ages under poor and good management and partly to see if there was any correlation between vitamin A stores and disease. The work was not planned in the biometrical sense yet the numbers examined are sufficient to give leads. It is clear that hatchability and the growth of young chickens should become subjects of vitamin A experiments. In particular, the absolute intake of vitamin A rather than the amount in the feed should be plotted against growth. This work has been planned.

Diagnostic Services and Routine Analyses.

A great increase in the analytical work connected with the diagnosis of animal health problems has taken place this year. The range of tests was wide, covering copper, phosphate, carotene, vitamin A, thiamin, riboflavin, serum calcium; magnesium, molybdenum, sulphate and copper in pastures; lesser constituents of stock foods; fluoride in water; and the short-chain fatty acids of silage.

The thousands of confirmatory or diagnostic checks in blood and liver specimens which have been made over the past few years are now being critically examined by the Animal Research Institute with a view to using them for regional studies.

Publication.

"The preservation of bovine blood for the determination of inorganic phosphate in the diagnosis of aphosphorosis," by K. W. Moir, was published in the *Queensland Journal of Agricultural Science.*

CEREAL CHEMISTRY.

The laboratory facilities for this subsection continue to improve. Some interesting data were obtained from the quality survey of 1953 wheat. For example, certain areas produced grain of very low protein content in spite of the soil fertility, judged by the usual criteria, being good to very good.

From other studies it was known that the high C/N ratio and an associated copper deficiency in one area were reflected in lamb production. Several plots were subjected to treatments designed to lower the C/N ratio and to supply copper. The response is more than hopeful, protein levels being raised by up to 50 per cent. The treatments not only improved the quality of the wheat but increased the harvest.

Physical testing of flours from known wheats has proceeded and some interesting sidelines have arisen. For example, it appears that the alveograph has no scale suitable for many of our wheats.

Quality testing of wheats was carried out on 53 samples submitted by the Royal Agricultural Society of Queensland. The protein content ranged from 9.0 per cent. to 15·4 per cent. The winning sample of Festival from Inglewood received 151½ marks out of 155 and was judged as being equal in quality to No. 1 Manitoba, which is the accepted world standard.

TOXICOLOGY SECTION.

The two main projects undertaken this year were lead poisoning of poultry, and the fate of nitrates in the rumen.

Lead Poisoning.

Lead studies were commenced partly to check on older knowledge and partly to probe better the many lead fatalities that come before the laboratory.

In the past a level of 5 p.p.m. in the liver of pigs has been regarded as supporting evidence of lead poisoning, but local data show that livers from well-grown, healthy pigs contain up to 6·5 p.p.m.

In the experiments with poultry, white lead and lead acetate were administered in graded doses to young birds as regular intervals. Surprisingly, the birds thrived, gained weight rapidly, and showed no untoward signs even after consuming large quantities. When small amounts of lead salts were administered intraveneously the picture was abruptly different. Early signs of sickness and in some cases death within six hours occurred. The liver uptake was quick in all birds, but excretion too was rapid in those that survived long enough to yield valid figures. Post-mortem findings in the orally treated birds showed nothing abnormal.

It is now obvious that poultry can stand enormous doses of lead salts under the conditions of the experiments and that the levels of stored lead consistent with a diagnosis of lead poisoning (both in pigs and in poultry) will need recasting.

Nitrates.

The plotting of nitrates and nitrite losses under "paunch" conditions was continued for a period. From data to hand it seems reasonably certain that "paunch" cannot be used as a confirmatory check on nitrate poisoning. Field evidence and blood examination must remain the criteria as with cyanide poisoning.

Most cases of nitrate or nitrite poisoning arise from nitrate in grazing crops and therefore rarely involve pigs, so it is of interest to record two unusual cases with pigs which occurred this year. One case was due to cooked silver beet and the other to water containing over 1,700 p.p.m. of sodium nitrate equivalent. The water had been diluted with milk washings which apparently contained bacteria capable of converting sufficient nitrate to give a toxic level of nitrite.

Insecticide Residues.

Two separate projects were undertaken in co-operation with the Entomology Section, one in connection with lead arsenate residues on tobacco leaf and the other with residues of the same chemical on apples. The large amount of analytical data obtained is being assembled for publication.

General.

Arsenic was again responsible for most of the positive findings in connection with animal deaths and there are no indications that the hazards from careless handling of this substance are appreciated or that deaths from it are decreasing. The following cases illustrate this point.

Cattle, apparently with a depravity, burst an old drum left after a poisoning programme and as a result of eating the spilled contents 17 deaths occurred. Another case involved arsenate solution which ate through its container, dripped through a shed floor and contaminated fodder beneath.

The other more common poisons detected were strychnine, lead and phosphorus.

GENERAL ANALYTICAL SECTION.

Work in this section has followed its normal course of dip examinations and checking of registered preparations, pest destroyers, etc., for trueness to label. Every now and then there are complaints that some pest destroyer is not effective and the usual arguments are directed against the poison—not the users. Arsenic is the usual target, but rarely with justification.

The usual analytical work on fertilizers for the Standards Branch has been maintained. There have been few deviations from the guarantees.

Most specimens of green or carefully hayed material have this year shown high protein figures; in some cases legumes have exceeded the figures usually returned for the best "show quality" material. Two lucerne samples from the Atherton Tableland gave the very high values of 26·2 and 29·5 per cent. protein and the fibre figures were low. These two indices of nutrient status strongly suggest that the stands if hayed and milled would find a ready and profitable market for the poultry food trade.

PLANT NUTRITION SECTION.

Soil Surveys.

During a large portion of the year soil survey teams were working on land in the Dimbulah-Mareeba district which will be available for irrigation when the Tinaroo Falls dam is completed. A soils map of the 17,500 acres comprising the Granite Creek section was completed and the soils have been grouped according to their suggested land usage.

Field work on two portions near Dimbulah was completed. One comprises a section of 4,500 acres between Atherton Creek and the boundary of Granite Creek, and the other an area of 2,500 acres near Parada, known as the Parada-Mutchilba Section. The Parada-Mutchilba portion, in particular, is one of a very complex soil pattern due to the deposition of alluvial and colluvial material during the wet seasons. Certain of the heavier types contain undesirably high amounts of sodium in the clay complex and will need careful handling under irrigation.

One of the staff spent several weeks in the Cloncurry district with the C.S.I.R.O. Land Research and Regional Survey Section with a view to studying the methods used by this group of workers. An extensive area of country was covered during the period and the knowledge gained will be valuable in any future broad-scale reconnaissance surveys.

No detailed surveys of any large sections in the Burdekin district were made this year, but certain tracts near Clare which had not been previously thrown open for selection were mapped as land usage groups. This survey showed that although appreciable areas of levee soils exist in this locality, they occur mostly as narrow strips within flood plain country and would in consequence be difficult to manage during the wet season.

Two reconnaissance surveys were completed and the usual reports and soils maps submitted. One of these was of land near Abergowrie which had previously been set aside for sugar-cane cultivation, and the other of an area known as Section A on the opposite side of the Burdekin River to Clare. Section A contains an attractive area of levee soils similar in characteristics to those at Clare and Millaroo, but its development is not contemplated for some time. The arable portion of the Abergowrie land consists of alluvial flats, the remainder being hilly country. This land at Abergowrie seems best suited to dairying, although pineapples would almost certainly do well on certain parts.

The soil boundaries of several farms at Clare, which were amongst the early batch of allotments, were surveyed at the request of the Land Administration Board and a map of the soil types made.

Wallum Investigations.

In the summer of 1953 a summer grass variety trial was planted and oversown with legumes. Before the plots were planted the soil was treated with dolomite and given a dressing of a complete fertilizer mixture, including trace elements. The grasses used were paspalum, Rhodes, para, green panic and kikuyu and the associated legumes were lucerne, centro, and strawberry clover. All plots now carry a good stand of lucerne and in many of them centro is doing well after a poor start; strawberry clover did not establish. The para grass plots are outstanding in this trial, the next

highest yield being obtained from green panic. As a comparison of yields the following are the figures for the fifth harvest in cwt. per acre:—

Para	57·1
Green panic	25·4
Rhodes	19·7
Paspalum	13·4
Kikuyu	7.5

Numerous pilot rows of grasses and legumes were established in 1953-54 and the most promising of these were planted out this year into small plots of the heath country, some as pure stands and others in grass-legumes mixtures. Grasses which have done well in these plots are molasses grass, *Hyparrhenia* sp. *Andropogon* sp. and *Pennisetum* sp., and two of the most promising summer legumes are *Stylosanthes* sp. and *Pueraria* sp.

Of the winter grasses planted last year, phalaris and cocksfoot grew well and survived the 1954 hot summer weather. Associated legumes in these plots were lucerne, red clover and white clover; all of these did well and are now making fresh growth.

Following the results obtained from the variety trials, several additional fertilizer trials have been set out this year. One is designed to determine the minimum amount of dolomite required to establish lucerne on these acid soils, and another to find the optimum quantities of major and trace elements to use. Other trials established are comparisons of different nitrogenous fertilizers with oats, HI ryegrass and phalaris, and a trace element trial with molasses grass.

In addition, an established area of several acres of para grass has been divided into sections and oversown with various winter legume mixtures. The legumes have germinated well and show promise of making a good stand in certain plots.

Horticultural Crops.

An area of one acre devoted to pineapples has been planted in such a way as to give information on different types of planting material and different planting times. Four plantings of quarter-acre areas have now been completed. These consist of two spring plantings of slips and suckers and two autumn plantings of tops. The first area was planted in October, 1953, and was harvested late in the summer of 1955. The yield from pegged out areas taken at random was 24·42 tons per acre and the percentage of grades as follows:—Grade 1, 3·3; Grade 2, 94·4; and Grade 3, 2·3.

An experiment with pineapples on a small portion of health country has shown that on the drained heath this crop can be grown successfully by bedding-up, as is done with sugar cane in badly drained areas. The plants on the heath produced good-sized fruit, but they came into bearing later than those on the more elevated parts. This is believed to be due to the lower temperature on the flat country.

Bananas planted in the summer of 1953 have not done well but they had been subjected to the effects of three cyclones in the intervening period. This year's planting of the Lady Finger variety shows more promise.

Drainage work at Coolum has been most successful and the tremendous amount of runoff water from the various cyclones has been handled effectively. A further area of heath has been drained this year and it is planned to put this under pasture during the summer with a view to conducting grazing trials.

A soil survey of the Field Station at Coolum has been completed and a report is being prepared.

Analytical results associated with survey samples confirm our previous knowledge that these soils are strongly acid and highly infertile.

Country Laboratories.

The Atherton soils laboratory was completed during the summer and all the routine analytical work connected with the Dimbulah-Mareeba soil survey is now being carried out there. The Ayr laboratory, which was established in the previous year, has functioned effectively. In addition to analysing soil samples relating to surveys, it has been possible recently to undertake pasture analyses for the Regional Experiment Station and do certain other analytical work connected with tobacco soils.

Soil-Plant Inter-relationship Problems.

Work on tobacco nutrition has underlined the importance of gathering more data on chlorides in soils and waters.

Boron and molybdenum deficiency signs are still prominent among the specimens submitted for foliar diagnosis, but a number of cases of plant damage from excess chlorides, usually in the irrigation water, was recorded.

Investigations.

An investigation connected with malnutrition in bananas proved it to be due to toxic amounts of arsenic in the soil derived from rock weathering. The affected areas were all associated with rock outcrops. An article on the subject has been prepared for publication.

Boron deficiency studies in horticultural crops are proceeding and a comprehensive field trial has been set out at Ormiston. Chemical data relating to the amounts of boron in soil and plant will be determined.

Additional studies proceeding are phosphate fixation and nitrate production in certain pasture soils, and nutritional work on tobacco.

Routine Analyses.

During the year, 2,400 soil samples and 630 samples of water were analysed. Reports on the fertility status of the soils were submitted to the production Branches and comments on the suitability of water for irrigation and/or stock or for mixing with dips and sprays were made to the owners of properties or to Departmental officers.

Publication.

A handbook on nutritional disorders in plants, illustrated in natural colour, was prepared by officers of the section and published under a grant from the Commonwealth Extension Services Fund.

DIVISION OF ANIMAL INDUSTRY.

VETERINARY SERVICES BRANCH.

Mr. C. R. Mulhearn, Director of Veterinary Services.

RURAL CONDITIONS.

Pastoral conditions were favourable throughout the spring and early summer except on the Barklay Tablelands, which did not get good rain until late summer. Heavy to flood falls were experienced in the Fitzroy, Mary, and Burnett Rivers. Flooding was severe in the Longreach and Charleville districts, and caused considerable stock losses. Late rains and a warm early winter have brought good feed along the coastal areas but are expected to cause souring of the grass in parts of the western areas. Fire risks are expected to be very high later in the year, but feed should come away very rapidly in the spring. The warm weather following the rains has greatly assisted grass growth but there is little herbage growth. Water supplies are assured.

STAFF AND ADMINISTRATION.

The general staff position continues to be unsatisfactory, for although an examination for appointment of Stock and Slaughtering Inspectors was held and all available successful candidates appointed, the total number on the field staff showed a slight decline due to resignations, retirements and other causes. New appointments included three officers to abattoirs to supervise meat grading and four replacement officers to enable experienced officers to carry out contagious pleuropneumonia extension duties. Two Veterinary Officers were promoted to the position of Divisional Veterinary Officer and four Assistant Veterinary Officers to Veterinary Officers.

Personal contact was made by the Director or Assistant Director of Veterinary Services with all senior field staff on one or more occasions, when problems of special interest to individual areas were discussed. Close co-operation was maintained with other Branches of the Department of Agriculture and Stock and with the Commonwealth Department of Commerce and Agriculture on special projects.

STOCK MOVEMENTS.

Although stock routes in north-western Queensland were in good condition throughout the year, the yearly turnoff from the Northern Territory was low owing to drought conditions in the Territory. Movements this year have been light because of mustering delays due to the late wet season.

The trend towards decentralisation of cattle sales was continued. New saleyards were opened at Hughenden and Cairns, whilst action is being taken to provide modern saleyards at Dalby and Kingaroy. Stud and herd bull sales were held at Bowen and Cloncurry.

The movement of cattle by sea from Cape York Peninsula to Cairns was advanced a further stage when approximately 5,000 head of cattle were transported by the barge "Wewak" during the year. Slaughter and breeding cattle totalling 2,500 head were exported by sea from Queensland to the Philippine Islands in six shipments.

MAJOR LIVESTOCK TROUBLES.

Contagious Pleuropneumonia.

Only nine active outbreaks of C.P.P. occurred during the 1954-55 season, eight in suspect areas and one in travelling cattle originating from and adjacent to a suspect area. This is the lowest annual incidence of the disease for many years. The significance of this is greater than may be appreciated, as inspections have been more widespread and thorough than during previous years. The low incidence of active outbreaks is considered to be directly associated with more intensive inspections and control in suspect areas and the enforced preventive inoculation of all cattle travelling from or through suspected areas.

Control has been effected by quarantine and inoculation as provided for by legislation. In addition, a general control programme by extension methods introduced in 1954 was continued this year. Officers engaged on this project have visited most suspect and many other properties in the suspect areas and have discussed plans for prevention and control of the disease. The importance of property improvement, such as the provision of paddocks and yards to permit handling, has been stressed. Each of the extension officers has been provided with a portable metal crush for demonstration purposes. This crush can be erected in from two to three hours and can be attached to existing yards used for general station work. Its use will permit inoculation of cattle at places where normal facilities are not available.

It is as yet too early to determine the importance of this method of approach, but follow-up visits have shown that planned inoculation programmes are being arranged on many properties. This is essentially a long-term project and it is anticipated that it will result in reduced incidence of the disease in both the suspect and other areas in future years.

Although the number of outbreaks was agreeably low during the year, it has been suspected that the disease is present in a smouldering form throughout most of the beef cattle country in south-western, north-western, and northern Queensland. This was confirmed by information obtained in co-operation with the Commonwealth Department of Commerce and Agriculture from the inspection of cattle killed at export meatworks between Cairns and Gladstone during the 1954 killing season. The inspections revealed that lesions suspected of being caused by previous attacks of the disease were present in from 1 to 5.5 per cent. of the cattle originating from suspect districts and from stations on which evidence of the disease was detected. The incidence of lesions was much higher on certain suspect properties and reached up to 15 per cent. of cattle marketed. Lesions suspected of carrying viable C.P.P. organisms were detected in 132 cattle originating on 21 properties.

Tuberculosis.

The campaign for the eradication of tuberculosis in dairy cattle was continued and expanded as further veterinary surgeons commenced practice in rural areas. Cream suppliers in the Beaudesert, Malanda-Ravenshoe-Millaa Millaa and Laidley-Lowood districts, and milk and cream suppliers in the Killarney and Nanango areas were brought under the scheme, increasing the number of animals under test by about 100,000. Details are given in Table 1.

TABLE 1.

CATTLE TESTED FOR TUBERCULOSIS, 1954–55.

APPROVED VETERINARY SURGEONS.

District.	Number of Herds.	Number of Tests.	Number of Reactors.	Percentage of Reactors.
Southport-South ..	123	8,785	36	·41
Coomera-Southport	175	11,660	62	0·53
Beenleigh North ..	253	9,785	21	0·21
North Brisbane and Petrie	28	1,527	20	1·31
Moggill-Kenmore ..	17	631	7	1·11
Samford	17	883	2	0·23
Beaudesert	99	9,231	38	0·41
Beaudesert-Border ..	16	2,581	19	0·74
Dayboro'	53	4,193	7	0·17
Dayboro'-Mt. Mee ..	35	2,869	6	0·21
Woodford	53	5,506	21	0·38
Caboolture	43	3,445	4	0·12
Southern Ipswich ..	276	11,593	16	0·14
Chamber's Flat ..	17	801	8	0·99
Maroochy Shire ..	360	18,792	131	0·70
North Ipswich ..	197	7,876	6	0·08
Boonah	285	14,939	179	1·20
Maleny-Landsborough	278	19,888	395	1·99
Esk	192	13,060	170	1·30
Total for Brisbane Area	2,517	148,045	1,148	0·77
Maryborough ..	2,751	170,338	867	0·5
Atherton-Townsville	265	13,261	47	0·35
Rockhampton ..	241	16,054	28	0·17
Toowoomba-Downs	1,747	84,135	319	0·37
Total	5,004	283,788	1,261	0·44
Grand Total ..	7,521	431,833	2,409	0·55

TESTING BY GOVERNMENT VETERINARY OFFICERS.

	Number of Herds.	Number of Tests.	Number of Reactors.	Percentage of Reactors.
Toowoomba ..	15	798	15	1·88
Maryborough ..	..	5,671	2	..
Townsville	43	11,336	214	1·81
Rockhampton ..	11	1,303	57	0·23
Atherton	..	2,769	82	3

It has been known for a long time that a high incidence of tuberculosis was present in certain beef cattle herds in Queensland but very little information was available on the general incidence in beef cattle throughout the State. It has also been suspected that the spread has been associated with the distribution of breeding cattle and this is supported to some degree by a greater incidence in the better class herds. The disease is also more prevalent in North Queensland in certain types and breeds of cattle and this may be due to the distribution of the disease from one or more studs.

A survey was undertaken in co-operation with the Commonwealth Department of Commerce and Agriculture during the 1954 cattle season, with the results shown in Table 3.

TABLE 2.

TUBERCULOSIS IN QUEENSLAND BEEF HERDS IN 1954.

Analysis of Records from Major Meatworks.

Number of Herds 282

General Incidence .. .. Percentage of Cattle Affected.

Under 1%	1%–2%	2%–3%	3%–5%	5%–10%	Over 10%
94	94	42	29	15	8

CONDEMNATION OF CARCASES FOR TUBERCULOSIS.

—	Number.	Number Condemned.	Percentage Condemned.	Estimated Value.
			%	£
Bullocks ..	142,440	876	0·61	30,660
Cows	28,336	368	1·2	8,464
Total	170,776	1,244	0·72	39,124

Tuberculin testing of beef cattle has been continued in problem herds in North Queensland and reactor percentages of up to 10 per cent. obtained. During the year, 15 herd tests have been carried out (9,802 head) and 189 reactors removed.

Brucellosis.

Brucellosis still remains the greatest single disease factor associated with infertility. Of 3,500 tests carried out for diagnostic purposes during the year, 749 (approximately 30 per cent.) were positive. Since tests are only made on selected animals, the incidence of the disease is much lower than this, but it is obvious that considerable herd wastage is caused.

Strain 19 vaccination has not made the progress hoped for in spite of the fact that the service is readily available. During the year approximately 30,000 young heifers were inoculated, or approximately 15 per cent. of the heifer replacements. Field results with the vaccine have been satisfactory. Very few abortions have occurred in vaccinates, and in most cases vibriosis or non-specific causes have been shown to be responsible. *Brucella abortus* has been isolated from aborted foetuses in only two or three cases, but high agglutination titres have been shown in some aborting vaccinates.

Sterility.

Considerable progress has been made in the investigation of sterility. The development of serum and more particularly mucus agglutination tests for the diagnosis of vibriosis has confirmed previous suspicions as to the widespread nature of this disease. During the year the presence of vibriosis has been confirmed on 45 properties, ranging from Toowoomba to Atherton and including all major dairying areas.

Brucellosis and vibriosis frequently co-exist in a herd and control recommendations are based on the relative importance of the two diseases. A picture of the course of typical vibro infections is emerging, characterised by some abortions but mainly by sterility and irregular oestral cycles. The disease in Queensland does not always appear to be self-limiting, and a planned campaign of controlled breeding, and in some cases antibiotic treatment, is necessary to stamp it out.

No further outbreaks of trichomoniasis were reported and all properties quarantined have made good progress towards eradication by controlled breeding.

Cases of infertility due to lack of feed, bad bull management, or mineral deficiency are not common.

Leptospirosis.

Under suitable conditions this disease was again prevalent in pigs and calves. Fourteen outbreaks were reported in adult cattle, characterised by abortion, jaundice, cessation of milk yield and mastitis. Haemoglobinuria was frequently absent in adults. In general, few deaths were recorded but economic loss was considerable. All adult cases except one due to *L. hyos* were due to *L. pomona*. The presence of leptospirosis has now been shown as far north as Georgetown.

Abortions and stillbirths in pigs were shown to be associated with leptospirosis on a number of properties, but in many cases no trouble is experienced in spite of the presence of positive agglutinins. This is in keeping with experimental findings. The disastrous effect of the introduction of infection to a previously clean piggery was shown at Wallumbilla. There is some suspicion that feral pigs may become infected.

Abortions and stillbirths in pigs were shown to be State were shown to carry agglutinins for *L. pomona*, *L. hyos*, *L. icterohaemorrhagia*, *L. robinson*, and *L. australis B.* Positive agglutinins to *L. pomona* were associated with ophthalmia in horses. The organism has not yet been isolated from horses.

Suspicious titres have been obtained in sheep but only one unconfirmed clinical case observed.

Tick Fever.

Owing to the favourable season, tick fever was extremely prevalent throughout the endemic area. It is noteworthy that in general, the disease has not been prevalent in previously clean areas to which tick infestation extended.

Anaplasmosis has occurred at Injune, Townsville, Taroom, and Brisbane. Except at Injune only individual animals were affected and losses were light. *B. argentinum* was seen in smears from a day-old calf.

External Parasites.

Cattle Tick.—The 1954-55 period has been very favourable for cattle tick propagation, and in addition to increased infestations within the recognised tick country there have been slight extensions into clean country at points along the whole of the length of the tick line from Central Queensland to the New South Wales border. Many new outbreaks have been recorded in country which was regarded as tick-free prior to 1954. Most of the outbreaks are regarded as natural extensions from the infested country, but a few have been caused by illegal stock movements and possible breakdown in the effects of dipping. Most of these outbreaks are within 10 miles of recognised tick-infested country, with an occasional one up to 20 miles distant.

All outbreaks in country previously regarded as being tick-free are being controlled by quarantine, regular treatments, and inspections. Synthetic insecticides are used for control in these areas.

Tick resistance to BHC has been known in some districts of Queensland for the past two years and now a strain of tick has shown what appears to be a resistance to DDT. There is also evidence to indicate that resistance to toxaphene and chlordane is developing.

Strategic dips have been maintained and have given satisfactory results with travelling cattle and cattle being cleansed for entry into tick-free country. Four additional dips have been charged, two in the West Haldon section of the Toowoomba district, one at Injune and one at Eidsvold. Observations were carried out on a power spray plant introduced from South Africa for tick control purposes. It is considered that this plant would be effective for the control of ticks within the tick-infested country and under certain circumstances it may prove useful for tick eradication.

The tick cleansing projects in marginal country at Flagstone Creek and West Haldon are being continued.

Buffalo Fly.—In spite of the extremely favourable seasons, fly penetration has not been as extensive as in some previous years. Organised control measures must receive much credit for this, though flood rainfalls caused temporarily unfavourable conditions for the fly.

The southern limit of infestation is the Mary River between Maryborough and Pialba, and north of Wandoan, Injune, and Monto. The rail spray is now at Howard and the mobile spray in the Maryborough area. Local treatment with DDT is completely successful in controlling the pest.

Lice.—Further reports of lice in sheep have been received. Control measures, particularly in travelling sheep and in paddock sheep in normally clean areas, have been enforced. Border crossings have received particular attention. There is evidence that Departmental action in this regard is endorsed by progressive graziers.

Lice in cattle have been more evident than usual but good seasonal conditions have minimised production losses.

Scrub Tick.—Heavy mortalities in weaner cattle were reported due to *Ixodes holocyclis*. At Millaa Millaa and Monto, treatment with DDT and removal to a fresh paddock halted losses.

Internal Parasites.

Owing to seasonal conditions internal parasites assumed considerable importance in sheep and cattle. As usual *Haemonchus* played the major role but lungworm infestation appears to be more important than previously. *Trichostrongylus* is of importance on the eastern Darling Downs in sheep, while *Oesophagostomum* as well as *Haemonchus* is receiving attention in south-western areas. Hookworms in cattle have been responsible for mortalities.

Sparganosis (*Diphyllobothrium erinacei*) has been diagnosed in pigs from Roma, Dalby, Georgetown, Ingham, Julia Creek, and Atherton. The great majority of cases have been in feral pigs, but in several cases domestic pigs with free range on swamp areas have been implicated.

Worms and coccidiosis of poultry have been reported.

Poisoning.

Arsenic again caused numerous casualties. Sources included malicious poisoning of a water trough, white ant poison, treated electric light poles, lead arsenate baits and sprays, flood debris, and overstrength dipping fluids. Accidental mixture of DDT spray in drums containing arsenical concentrate has caused fatalities.

Fatalities in calves from BHC and toxaphene were reported. Nitrite poisoning through reduction of high-nitrate water after standing when mixed with skim-milk was suspected of causing deaths in pigs.

Salt poisoning of cattle and poultry occurred. Phosphorus poisoning of ducks from rat baits was reported from Innisfail.

Poison plants were again responsible for a considerable number of deaths. Bracken, peach-leaf poison bush, and lantana were prominent along the coast, and soda ash, wild tobacco, and pigweed in inland areas. One mortality in sheep was ascribed to blue bush (*Chenopodium auricomum*), which is usually regarded as a good fodder plant. *Myoporum acuminatum* was implicated in a number of deaths.

Pathological changes in the stomach typical of oesophageal disease were produced in Rockhampton by feeding a horse 735 lb. of *Crotalaria trifoliastrum* in 83 days. It is considered that this plant and not *C. aridicola* is responsible for the disease in the Rockhampton area.

Plants coming under suspicion for the first time were creeping lantana (*Lantana montevidensis*) in sheep and possibly cattle, cluster fig (*Ficus glomerata*) in horses and cattle, and native sensitive plant (*Neptunia gracilis*) in cattle.

In addition, there is some suspicion that *Phaseolus lathyroides* may be associated with abortion.

A number of deaths were ascribed to oleander (*Nerium oleander*) and tie bush (*Wikstroemia indica*). It is suspected that sudden deaths of cattle in the Georgetown district may be due to the ingestion of rubbervine (*Cryptostegia*).

Yellow-wood poisoning occurred in the endemic areas and chemical investigations into the toxic principle are being made. Bitter bark (*Alstonia constricta*), inkweed (*Phytolacca octandra*), green cestrum (*Cestrum parqui*), bellfruit (*Codinocarpus australis*), native fuchsia (*Eremophila maculata*), mulga fern (*Chielanthes tenuifolia*) and white cedar (*Melia dubia*) were associated with deaths.

Feeding trials with swamp grass tree (*Xanthorrhoea hastile*) produced a syndrome similar to that shown in wallum disease. Trials with milkweed (*Pratia concolor*) are in course of preparation.

Mineral Deficiencies.

A considerable number of blood and liver specimens were examined for copper and phosphorus.

Copper deficiency was shown to exist throughout the Maleny district and also on the Atherton Tablelands, Upper Burnett, and Georgetown districts, as well as other known deficient areas. In some cases copper deficiency was associated with typical scours and wasting, but in others equally low figures appeared to have little effect. Some correlation between low copper and sterility was noted.

Sawfly.

For the first time in this decade, sawfly larvae were responsible for cattle losses in the Eidsvold and Augathella districts during the winter of 1954. Losses on individual properties were heavy. The emergence of grubs this year is late and in small numbers and no mortalities have been reported.

Investigations last year showed that the toxic principle was present in the living as well as the decomposing larvae and that it resisted heat treatment to 100°C., thus rendering it unlikely that a bacterial toxin is the cause. Trials on protein or mineral deficiencies as a basis for the depraved appetite have been delayed by the non-appearance of the larvae. This has always been one of the drawbacks in the investigation of the disease.

Soil areas licked by affected cattle have been shown to be high in sodium sulphate, sodium chloride, and phosphorus.

MISCELLANEOUS CATTLE DISEASES.

Footrot has been fairly prevalent and good results were obtained with sulphadimidine therapy. Limited trials with footrot vaccine have given good protection for three months.

Staphylococcal mastitis gave considerable trouble and the hygienic approach proved the most valuable. None of the drug treatments used gave consistently satisfactory results.

Enzootic haematuria was recorded from Beerwah, Kingaroy, and Toowoomba. A case of xanthosis was recorded from Boonah.

The occurrence of endemic botulism in cattle has been suspected for some years in northern and north-western Queensland. A toxin similar to that of *Clostridium botulinum* has recently been isolated from bones on a Townsville property and is being further examined. Cattle on two affected properties have been inoculated with botulinus toxoid and no further mortalities reported.

Losses of fat bullocks occurred at the Brisbane abattoirs. The provision of shelters in yards where losses occurred last year appears to have made these particular yards much safer. The present losses were in a mob which had been driven fast for several miles.

MISCELLANEOUS DISEASES OF HORSES.

Walkabout disease appeared to be much less prevalent this year, possibly because of the poor growth of *Crotalaria retusa*.

Queensland itch has been particularly prevalent and a great number of enquiries on this subject have been received.

Outbreaks of epidemic blindness have been reported on the Darling Downs and several of the affected animals have shown positive titres to *L. pomona*.

Equine influenza appeared in horses returning from the Rockhampton races and has since occurred sporadically in the Barcaldine district, with minor flare-ups following local race meetings.

MISCELLANEOUS DISEASES OF PIGS.

Salmonellosis and Glasser's disease were again prevalent in pigs. Cases of pneumonia not responding to sulphonamides have been observed and treatment with chloramphenicol against virus infection is being investigated. *Erysipelothrix rhusiopathiae* was recovered from 15 outbreaks and serological confirmation obtained in three others. The majority of cases occurred between July and September; they were mainly of an acute nature, whereas previously only scattered cases of a chronic type had been recorded.

Malleomyces pseudomallei has been isolated from a pig herd which had contact with infected goats. Trials of allergic and serum tests in pigs are being checked on slaughter. The allergic test in pigs does not appear to have a high specificity.

MISCELLANEOUS DISEASES OF SHEEP.

Salmonellosis and hypocalcaemia in travelling sheep have been reported on a number of cases. Succinyl sulphonate gave good results against salmonellosis.

Pregnancy toxaemia has been responsible for serious individual losses but is not prevalent.

Cases of poisoning by pigweed and soda bush were recorded.

MISCELLANEOUS DISEASES OF POULTRY.

Investigations into the distribution of infectious laryngo-tracheitis have shown the disease to occur in the Brisbane, Toowoomba, and Cairns districts. Vaccination is restricted to flocks in which the disease has been confirmed either by isolation of the virus or by challenge tests. Some 27,000 birds have been prophylactically vaccinated in the Brisbane area.

Bluecomb has become a source of serious mortality, especially in pullets in the Brisbane area; it is of less importance in other districts. No satisfactory treatment has been evolved, but a comprehensive antibiotic trial is proposed and will be put into effect as soon as practicable.

Stickfast flea was reported from Tannymorel, but now appears to be eradicated. The Helidon infected area is also apparently clean. The city of Townsville area is infected and examination of surrounding districts is being made.

Investigations into the significance of pleuro-pneumonia-like organisms (P.P.L.O.) are continuing and economically successful therapeutic use of streptomycin is claimed.

Botulism, "crazy chick" disease and epidemic tremor were reported.

EXTENSION SERVICES.

Senior officers of the Branch attended a school in extension methods organised by the Department at which the aims and methods of extension were fully discussed.

Field days and meetings have been organised and attended in all districts. The projector unit at Rockhampton has been in constant use, with gratifying results. A film tour of the Windorah-Birdsville area was organised and implemented by the Branch.

Greater use is being made of mass media such as broadcasting and newspapers. Show exhibits and special displays received attention.

The C.P.P. extension project was continued in the Townsville and Cloncurry districts and extended to the Rockhampton and Charleville districts.

BRANDS.

TABLE 3.

DETAILS OF REGISTRATIONS, TRANSFERS, ETC., FOR THE YEAR 1954–55.

Item.	Number.	Number since Inception of Legislation.
Ordinary Three-Piece Horse and Cattle Brands Registered	..	92,242
Cancelled Horse and Cattle Brands Registered	915	16,973
Horse and Cattle Symbol Brands Registered	127	3,005
Horse and Cattle Brands Transferred ..	1,882	84,957
Cattle Earmarks Registered	662	37,314
Sheep Brands and Earmarks Registered ..	304	14,792
Sheep Brands and Earmarks Transferred ..	290	9,868
Distinctive Brands Registered	9	1,355
Alterations of Address of Brands	301	..
Brands Cancelled	25	..
Earmarks Cancelled	143	..

There has been an increase in the number of registrations of Symbol Brands, Cattle Earmarks, and Sheep Brands and Earmarks and a decrease in the registrations of Horse and Cattle Brands and Transfers of Horse and Cattle Brands.

The fees received were slightly in excess of last year's receipts.

Very few reports have been received regarding incorrect branding and earmarking and owners generally appear to be complying with the provisions of the Acts.

The Sheep Directory complete to the end of 1953 has been received and copies forwarded to all inspectors. A revised edition of the Sheep Directory complete to the end of 1954 will be forwarded for printing in the near future. The Horse and Cattle Brands Directory complete to the end of 1952 has not yet been printed, though work on it is well advanced.

NEW LEGISLATION.

A Bill to amend *The Stock Acts, 1915 to 1953* was designed primarily to make the necessary provisions to meet any emergency likely to arise in the event of an outbreak of foot and mouth disease. The speed of modern transportation has increased the vulnerability of this country insofar as this disease is concerned. Its introduction has so far been averted by stringent quarantine measures.

Subsidiary clauses in the Bill provided for the control and supervision of boarding kennels maintained for the accommodation and/or treatment of domestic pets, as a precaution against the spread of infectious diseases, for the introduction of poultry into the ambit of the principal Act, and for the removal of some anomalies which have become evident with the passage of time.

BREACHES OF ACTS.

The co-operation that stock-owners and others generally accord to field officers of the Branch usually obviates recourse to legal proceedings. There were 10 prosecutions under the Stock Acts, seven under the the Slaughtering Act, and none under the Brands Acts.

The most serious breaches under the Stock Acts again involved the travelling of stock without permission of an Inspector. Other breaches included failure to complete a waybill prior to travelling stock. The most serious breaches under the Slaughtering Act were those where licencees of slaughterhouses failed to observe the regulations dealing with the proper disposal of blood and ingesta. Such breaches, because of the fly menace, are regarded seriously.

MEAT INSPECTION SERVICES.

The year has been an unusually eventful one for the meat inspection services.

The Meat Grading Regulations of 1955 for the control of grading and marketing of meat for local consumption in the Metropolitan and Toowoomba Local Areas were introduced under *The Slaughtering Act of* 1951. Provision has been made for the branding of third grade beef and mutton, previously unbranded, with an orange ink, and for all beef and mutton sold for consumption in the areas specified to be graded and marked. Grading for local consumption according to export standards introduced towards the end of last year was found to be unsuited to the domestic market and specifications better suited to local requirements were introduced. The effect of this has been that more quality yearling beef has found its way on to the local market.

The Toowoomba Local Abattoir Board's Abattoir at Harristown began operations in February, 1955. There has been considerable activity on the part of other Local Abattoir Boards during the year to get works under construction and realise the aim of centralised killing facilities in their respective areas.

Progress has been made with respect to country slaughtering. A system of quarterly reports on all slaughterhouses has been instituted. Gratifying progress has been made insofar as improvements to existing facilities are concerned.

Continued close co-operation between meat inspection services and field disease control services has been a feature of the year's activities. The valuable co-operation of Commonwealth officers at export works in collecting such information is much appreciated.

The sale from refrigerated show cases of meat prewrapped in approved transparent packages was introduced in the Brisbane area and provision is being made for the extension of this modern method of meat marketing.

RESEARCH BRANCH.

Dr. J. Legg, Director of Research.

This report covers activities at the Animal Research Institute, Yeerongpilly, and the Animal Health Station, Oonoonba.

For the development of research in animal husbandry, Mr. J. W. Ryley was appointed Senior Husbandry Officer and three Assistant Husbandry Officers were appointed after taking special post-graduate training—Mr. J. S. F. Barker in animal genetics and Messrs. J. G. Morris and R. M. Beames in animal nutrition. Mr. M. J. Radel was appointed to manage the sub-station at Rocklea.

At Rocklea, a modern building to house 40 cattle for nutritional and other experimental work, with ancillary feed stores and a small laboratory, was completed. Construction of yards and the provision of other farm improvements such as subdivision fences, water and roads are under way. The poultry research unit is now equipped with a second row of 12 pens and a third row is being built.

These developments enabled two projects to be commenced, one to examine the value of bush hay made in the Central Highlands as a drought fodder for cattle, and the second, the possibility of using bagasse-molasses as a cattle feed.

Five Jersey bulls have been purchased from leading studs for a bull proving project which will commence in October in dairy herds in herd recording units in the Maleny-Nambour area. These bulls will be kept at Rocklea and semen from them will be issued regularly to field officers carrying out artificial inseminations in the herds in the scheme. Assembly of equipment and development of techniques for this work are now nearing completion.

COPPER DEFICIENCY IN CATTLE.

Cattle grazing good paspalum-white clover pasture at Rocklea were noticed to have very low (deficient) levels of copper in their livers. An experiment was therefore run from December, 1953 to March, 1955, with 20 Hereford cows, 12 weaner calves and 5 pairs of identical twins, each divided into copper-treated and untreated groups. Copper deficiency was corrected by injecting copper sulphate every 2-3 months. Chemical analyses of liver and blood samples showed that the untreated cattle were copper-deficient throughout the trial. However, there was no difference in liveweight changes of the copper-treated or copper-deficient groups when both groups were gaining weight or when both groups were maintaining or losing weight. Blood phosphorus levels in both groups were often marginal and low.

During the favourable winter of 1954 the good paspalum-white clover pasture appeared to be inefficiently utilised because of poor palatability and grazing patterns or other undisclosed factors. Two further trials have therefore been planned to commence in the spring to determine what factors in addition to copper deficiency are limiting the productivity of cattle on this pasture.

Another trial on the Near North Coast is being run in collaboration with other Branches and is now in its third year. It was found that Hereford heifers grazing a carpet grass-paspalum pasture topdressed twice yearly with copper sulphate maintained normal liver and blood levels of copper throughout the year. However, these cattle also showed marginal to low blood phosphorus levels at certain seasons, and a trial to examine the effect of bonemeal lick on this deficiency is now under way.

STRUCTURE OF CATTLE BREEDS.

A study of the structure of the Jersey breed in Australia was undertaken to determine how genetic improvement, if any, is passed down from leading studs to commercial Jersey herds. From the 10,404 Jersey heifers registered in the latest available Jersey Herd Books (1953) a sample of 200 heifers was drawn at random. The pedigrees of these 200 heifers were then traced back to the fourth generation, and all the sires in the four generations were listed. The stud prefixes of these sires were then used to tabulate the relative importance of each stud, that is, the studs were ranked in order of their popularity as sources of sires.

The six most important studs, or "parent studs," were found to be "imported" (i.e., classing all imported animals as of one stud for the purposes of this survey). Two were in Queensland, two in New South Wales and one in Victoria.

The relative importance of individual sires was estimated in a similar manner. Of the six sires with greater than 1 per cent. direct relationship to the breed, it was found that five were imported and only one was bred in Australia (in New South Wales). It was not possible to determine whether the leading sires were in fact improving production, because of insufficient production records on which to base conclusions.

It is considered that livestock should be evaluated and selected in the environment in which they are to be used. It is therefore important in a tropical and subtropical environment like Queensland to determine the influence that cattle selected in other environments are having on the cattle population in this State.

SPECIMENS EXAMINED AND VACCINES SUPPLIES.

Tables 1 and 2 set out the number of specimens received, vaccines supplied, &c.

TABLE 1.

SUMMARY OF SPECIMENS EXAMINED.

——	Yeerongpilly.	Oonoonba.	Total.
Number of batches of specimens ..	3,841	493	4,334
Complement fixation tests for contagious bovine pleuro-pneumonia ..	992	..	..
Brucellosis agglutination tests—			
Bovine	4,881	361	5,242
Porcine	2,221	35	2,256
Leptospirosis agglutination tests—			
Bovine	721	..	721
Porcine	1,623	..	1,623
Ovine	14	..	14
Equine	67	..	67
Caprine	4	..	4
Dark-ground examination of urine—			
Bovine	80	6	86
Porcine	57	..	57
Equine	2	..	2
Vibriosis agglutination tests	2,383	..	2,383
Milk samples (mastitis)—			
Bovine	393	311	704
Ovine	2	..	2
Autopsies—			
Cattle	48	5	53
Sheep	55	4	59
Goats	1	5	6
Swine	149	19	168
Fowls	1,183	108	1,291
Dogs and cats ..	2	..	2
Horses	1	3	4
Other animals and birds	28	6	34

TABLE 2.

VACCINES SUPPLIED.

——	Yeerongpilly.	Oonoonba.	Total.
Contagious pleuro-pneumonia (doses)	132,525	261,350	393,875
Infectious labial dermatitis (doses) ..	174,000	..	..
Brucella abortus Strain 19 (number of calves inoculated)	10,483	..	..
Tick fever blood (doses)	32,032	5,518	32,550

DISEASES AND PARASITES OF CATTLE.

Tick Fever.

Table 3 sets out the number of cattle immunised against the tick fevers and bleeders sold at Yeerongpilly over the last 10 years. In the past year, 17 bleeders were sold by and 85 stud animals immunised at Oonoonba.

TABLE 3.

Year.	Bleeders Sold.	Stud Cattle Immunised.
1945–46	73	190
1946–47	76	170
1947–48	134	187
1948–49	110	312
1949–50	156	467
1950–51	214	569
1951–52	111	364
1952–53	234	423
1953–54	149	643
1954–55	160	489

Control of Cattle Tick.

Work has been continued and expanded in some directions. New facts are coming to light as a result of experience. For instance, we have been able to confirm in the laboratory and under exacting tests the contention by some stock-owners that ticks were becoming resistant to some of the chlorinated hydrocarbons that have now been in use for about seven years in this State.

A strain of tick originating from the Rockhampton district, where it was alleged difficulty was being encountered in tick control with DDT, has been maintained at the laboratory at Yeerongpilly and placed under critical tests. The results left no doubt that the parasites were definitely resistant to DDT, large numbers escaping after treatment at the recommended levels. This is believed to be the first record of DDT-resistant ticks anywhere.

Toxaphene-resistant ticks have been reported from several districts over the year and the testing of a strain originating from the South Coast district left no doubt that it possessed a relatively high resistance to control by this insecticide. Ticks resistant to benzene hexachloride are of course well known.

The maintenance of these various resistant strains and cross testing of them, though very desirable, is beyond the limits of our accommodation.

Ticks have shown some resistance to chlordane in the one herd being treated with this preparation. Spraying of this herd commenced seven years ago and the parasites were kept in control over the years without any great difficulty. Towards the end of the 1954-55 summer, however, the parasites were showing a definite resistance.

The position has now been reached where ticks resistant to one or other of the chlorinated hydrocarbons in common use can be found in almost all the various tick-infested districts of the State.

Work has been commenced on the use of some of the organic phosphates in tick control. Research on this group of insecticides commenced some years ago, one of the first tested being parathion, which although highly lethal to the tick was found to be too severe on the host animal. Two more recently introduced, diazinon and malathion, have recently been under preliminary test and found to give encouraging results. At levels higher than those at which a complete kill of parasites can be expected, no harmful effects are noted so far as the host animal is concerned, so the margin should be fairly safe. Moreover, early trials suggest that ticks resistant to DDT and to toxaphene have no specially significant resistance to the organic phosphates.

It is not known whether these preparations can be put up in a suitable form for use in dipping vats. It seems unlikely that they will lend themselves to use in this way, but they should be valuable for the control of cattle ticks on dairy farms when used as sprays. Their residual effect is not very high, but this would not be a very serious drawback in tick control in the field.

Field trials are needed to confirm some of this earlier work.

Infertility.

Research on infertility problems during the past year has been mainly on improving diagnosis of vibriosis and trichomoniasis and the study of these diseases in experimentally produced cases.

Vibriosis.—There was a marked increase in the number of samples of mucus and serum submitted for the *Vibrio fetus* agglutination test during 1954-55. The results indicate that the disease is widespread. The preparation of the antigen is tedious and has occupied a considerable portion of the bacteriological staff's time.

A bull that showed a positive agglutination titre was obtained from an infected herd. It was mated to three virgin heifers and regular samples were taken from the four animals to determine the presence of the organism or of agglutination titres to it and for how long these would persist.

Over six months the titre of the bull has become negative. Vibrios have been cultivated, although not in pure culture, from preputial samples 12 times at irregular intervals over six months. The heifers showed no evidence of infection during the same period. A recently isolated culture of *V. fetus* was inoculated into the uterus of one of these heifers on May 4 when it was four months pregnant. On May 20 a positive serum agglutination titre was obtained and it has been maintained for a month. Mucus taken over the same period has shown no agglutination and the organism has not been cultured.

Trichomoniasis.—Three heifers were infected by service with an infected bull. Results show that cultural examination of vaginal mucus is a valuable method of diagnosis. Infection persisted in two animals for at least four months, while in the third infection was not diagnosed later than two months after infection. This animal was re-mated to an infected bull three months after the last positive diagnosis and reinfection occurred. On autopsy 14 days after reinfection, trichomonads were isolated from the vagina but not from the uterus. It is considered that a three-month's sexual rest, as advocated by some workers, is not sufficient to control the disease.

A Queensland strain of *T. fetus* has been typed as a Belfast serotype.

Wallum Disease.

A 200 lb. heifer fed *Xanthorrhoea hastile* with a small amount of oaten chaff ate 479 lb. of the swamp grasstree in 73 days. At the end of the feeding the beast appeared normal but 10 days later it showed mild symptoms of "wamps." During the next week the disease became more evident until it was quite typical, with dribbling urine, humped back and swinging of the hindquarters always to the same side. With careful nursing the experimental animal recovered and six weeks later was normal. Specimens taken during the trial showed normal figures for blood vitamin A, serum calcium and blood phosphate.

The experiment demonstrated that *Xanthorrhoea hastile* is a cause of "wamps." This resolves the wallum diseases in which ataxia is a prominent symptom into *Macrozamia* (zamia) poisoning and *Xanthorrhoea* (grasstree) poisoning.

DISEASES OF SHEEP.

Sheep Body Strike Experiments.

Further experiments were conducted in association with C.S.I.R.O. on the protection offered by insecticides against body strike in sheep.

Various concentrations of DDT, BHC, aldrin, dieldrin, malathion and diazinon were applied to a strip about 12 in. wide along the back from the head to the tail by jetting so as to saturate the fleece or as a surface spray that only wet the top of the fleece.

Artificially attractive plugs were clipped into the fleece to encourage oviposition from heavy insectary populations of *Lucilia cuprina* and give a measure of the anti-adult properties of the insecticide. An estimate of larvicidal properties was obtained by means of larval implanting techniques.

None of the insecticides will prevent oviposition for long periods. Even DDT at 1.0 per cent. and aldrin and dieldrin at 0.25 per cent. allow oviposition on the majority of sheep when checked five weeks after treatment. Though oviposition is not prevented, the fleece is still toxic to adult flies. Exposure of treated sheep in an insectary for 4-5 hours will reduce the population of *L. cuprina* to less than half in 24 hours.

The experiments show clearly that jetting to the skin with all the insecticides gives a very much longer period of protection against larval development than tip spraying. Tip spraying with 0.25 per cent. gamma BHC gave protection for three weeks, while jetting with the same concentration prevented larval development for 17 weeks.

DDT does not have sufficient residual larvicidal properties to be of field use. Jetting with 1.0 per cent. DDT allowed larval development after six weeks.

Aldrin and dieldrin appear to be the most effective larvicides. High concentrations (0.1 to 0.12 per cent.) applied by jetting will give 16-17 weeks' protection, while lower ones (0.05 and 0.01 per cent.) often give 6-10 weeks' protection.

BHC at 0.1 and 0.25 per cent. gamma is also very effective, giving 10-13 weeks' protection, but as the concentration is reduced the period of protection falls off very rapidly and cannot be compared with that given by aldrin and dieldrin.

An organic phosphate, malathion, is very toxic to larvae for short periods but does not persist on the fleece. Concentrations of 0.05 and 0.25 per cent. allowed larval development after 6-8 weeks.

Another organic phosphate, diazinon, shows promise as a useful insecticide. Concentrations of 0.025 to 0.1 per cent. in an uncompleted experiment have given absolute protection for over 12 weeks.

Numerous field trials have been conducted in the Roma, St. George and Stanthorpe areas, but the absence and near-absence of strikes have made field comparisons impossible.

Psorergates ovis, the itch mite of sheep, was identified from the Stanthorpe area. This parasite had only been recorded from the Cunnamulla district but there is clinical evidence of a much wider distribution.

Epididymitis in Rams.

Further work with the intradermal skin sensitivity test has shown that although this will detect a great number of the infected animals, an occasional infected animal is not detected. This has been the experience with similar tests for infection with the other Brucella.

It has been found that the best method of detecting infected rams is by bacteriological examination of the semen. Cultural methods are to be preferred, but we find a modified acid fast staining method very reliable.

DISEASES OF PIGS.

Erysipelas.

Suspicious cases of this disease were reported in 1940 and it was confirmed bacteriologically in 1942. The arthritic form of the disease has been confirmed bacteriologically almost every year since then. In the winter and spring of 1954 the septicaemic type of erysipelas occurred in several widly separated areas, causing heavy mortalities. Young pigs (for example, unweaned litters) were most frequently involved. The charactesistic symptoms were reddening of the skin, high fever and rapid death. Lesions principally were haemorrhages and swelling of body, congestion of and swelling of liver and spleen, intense gastritis, and enteritis.

A veterinarian developed an acute infection of the hand suggestive of eyrsipelothrix following an investigation of an outbreak, but no bacteriological examination was made.

Leptospirosis.

Further studies on *L. pomona* infection of swine showed that normal litters were produced by mating sows after they had thrown off infection. Work on *L. pomona* has ceased temporarily and attention given to *L. hyos*.

Four sows were infected with *L. hyos* to determine the effect of this species of *Leptospira* on breeding performance. No clinical evidence of infection occurred. One sow farrowed a week prematurely, and the litter consisted of nine piglets of which only three survived. Two other sows produced normal litters at full term. The fourth sow has not yet farrowed. As these results are inconclusive more sows will be infected.

DISEASES OF POULTRY.

Bluecomb.

For several years a disease resembling that described as bluecomb, pullet disease, or monocytosis has been recognised in Queensland. It is characterised by swelling and focal necrosis of the liver, distorted soft yolks, degeneration of pectoral muscles, catarrhal enteritis and slight nephritis.

Over the past year this disease appears to have occurred in another form—that is, with nephritis as the principal lesion.

Avian Encephalomyelitis.

A disease of chickens characterised by ataxia and rapid tremors of the head and neck has been seen in chickens submitted from several hatcheries since 1952. During 1955 five batches of chickens showing a similar syndrome were received. All originated from the same hatchery.

The disease has been transmitted through three generations by injection of brain emulsion intracerebrally into chickens 1—3 days old. Ataxia appears at about the 9th day after injection. Tremors have not occurred until later and only in chickens which have shown ataxia.

Effect of Diet on Caecal Coccidiosis.

A series of experiments was undertaken in association with officers of the Poultry Branch to examine the effect of diet on artificially induced coccidiosis. The rations used differed only in the type and combination of the animal protein fractions. Chickens were obtained from commercial hatcheries and fed from day-old on the test ration. At 3½ weeks of age they were infested with varying doses of freshly sporulated oocysts of *Eimeria tenella*. The mortalities over the next 10 days were taken as a measure of the prophylactic effect of the ration. Weight gains proved unreliable due to the small number of survivors in many groups.

The results from a series of 10 experiments show that the incorporation of buttermilk powder in the ration does reduce the mortality from artificially induced caecal coccidiosis, but the effect may be modified by other factors. The greatest prophylactic effect was noted with strains of chickens believed to be very susceptible to coccidiosis and receiving low to moderate doses of oocysts. In these chickens, on a high oocyst dose, no protection could be detected. With more resistant strains of chickens receiving moderate doses, the prophylactic effect was not marked.

The difference in susceptibility was well shown in an experiment where eggs were obtained from 11 different farms and hatched and the chickens brooded under identical conditions on the same rations and given a moderate dose of oocysts. Table 2 shows that not

TABLE 2.

PERCENTAGE MORTALITY FROM CAECAL COCCIDIOSIS.

White Leghorns.					Australorps.					Cross-breeds.
A	B	D	G	I	C	E	F	H	J	K
0	11	28	22	33	45	18	59	19	41	50

only is there a difference between the breeds used but there is also a large difference in susceptibility between hatcheries within each breed.

The difference in strain susceptibility and size of oocyst dose may partly explain the inconclusive experimental results with milk products compared with the popular field belief that milk products do have a beneficial effect on outbreaks of caecal coccidiosis.

POISONING OF LIVESTOCK.

Minerals, Insecticides, etc.

Arsenic.—Although the number of reported mortalities from this drug was fewer than in the previous year, it must be considered as a major cause of death in farm animals. Arsenical poisoning was diagnosed on 37 occasions in cattle and once each in sheep, pigs, and turkeys.

Lead.—Deaths occurred in cattle on three occasions, in sheep once and in dogs twice.

Phosphorus.—One mortality in fowls.

Strychnine.—One mortality in dogs. In this case there was also a high level of lead in the liver.

Salt.—One mortality in chickens. The salt appeared in the ration in lumps as large as hen's eggs. When ground in a hammer mill the salt content of the ration was 5.9 per cent.

Phenothiazine.—One mortality in goats.

BHC.—One mortality in sheep and two in cattle.

Toxaphene.—One mortality in which two calves died and eight others were sick but recovered.

DDT.—Suspected in fowls.

Sodium fluoride.—Suspected once in pigs.

Nitrite.—Suspected once in pigs. The ration consisted of crushed grain and milk with bore water added. The bore water contained nitrate equivalent to 1,717 ppm sodium nitrate and a small quantity of nitrite.

Zinc.—Suspected in pigs. Several 3-months' old pigs developed malaise, anorexia, inco-ordination and hyperaesthesia. Twenty feet of new ¾in. galvanised piping had been laid in the piggery a week before onset of symptoms. Analysis of the first milk from the pipeline contained 130 ppm (0.013 per cent.) zinc, and a milk-meatmeal mixture fed to the pigs contained 16 ppm (0.0016 per cent.) zinc. A level of 0.005 per cent. is considered toxic.

Plants.

Amongst the many plants that came under suspicion during the year the following are mentioned:—

Pteridium aquilinum (bracken).—In four herds at Cedar Pocket, Pomona, Cooran, and Gympie.

Alstonia constricta (bitter bark).—In one herd at Watalgan.

Nerium oleander (oleander).—In two herds, at Acacia Ridge and Inglewood.

Euphorbia drummondii (caustic creeper).—In two mobs of travelling sheep at Charleville.

Nicotiana velutina (native tobacco).—In travelling steers at Charleville.

Rhubarb.—In fowls in the Brisbane area.

Cyperus sp.—In travelling horses at Winton.

Melia dubia (white cedar).—In pigs at Thangool.

Cheilanthes tenuifolia (rockfern).—In cattle at Cottonvale.

Cestrum parqui (green cestrum).—Feeding trials indicate that relatively large doses (that is ¾ to 1 oz. of fresh leaf) from mature fruiting green cestrum may cause death of fowls overnight. The effects are similar to those shown by cattle and sheep—acute liver and kidney damage, muco-catarrhal enteritis, injection of the mesenteric vessels, excessive pericardial fluid, injection of vessels and splashed haemorrhages of the cardiac muscles. These findings are in keeping with field observations where mortalities have occurred within 24 hours of fowls having access to the plant.

OONOONBA ANIMAL HEALTH STATION.

The old cattle yards originally built in 1914 have been demolished and new ones erected. A weighbridge has been installed. Some new equipment has been added to the laboratory.

An increased volume of contagious pleuropneumonia vaccine supplied is a reflection of the campaign aimed at C.P.P. control in the northern beef herds now being pressed by the Department.

Cattle.

Eighty-three head of cattle were received for immunisation against tick fever and 15 bleeders prepared and sold.

Specimens of bovine pleuropneumonia were received during the year from two centres.

Tick fever due to babesiosis was noted at several widely separated points. Anaplasmosis was diagnosed in one animal in the Ingham district.

Leptospirosis in cattle has been suspected as a result of positive serum titres but the organism has not yet been cultivated. The same remarks apply to vibriosis.

Sudden deaths in cattle have been reported in certain areas around the watershed of the Etheridge River. All the country is second-rate grazing land and there is much rubber-vine (*Cryptostegia grandiflora*) present which is eaten by some of the stock. All the evidence points to this plant being responsible. This plant is now well established in the north and is spreading rapidly and could easily become a very serious problem to the pastoral industry in the years to come.

Horses.

Walkabout disease has been observed in the Charters Towers district, and to help throw some further light on this problem feeding tests were carried out with *Crotalaria trifoliastrum,* a plant common in the north. This plant was selected because one of the same genus, *C. retusa,* is known to be one of the causes of walkabout in the Northern Territory. Results were not conclusive.

Other Animals.

Melioidosis was diagnosed in pigs and goats in a piggery close to Townsville. Coccidiosis and tetanus were both noted in goats.

The most important disease conditions of poultry were avitaminosis A, leucosis, histomoniasis, botulism, blackcomb, and infectious laryngo-tracheitis.

SHEEP AND WOOL BRANCH.

Mr. G. R. Moule, Director of Sheep Husbandry.

Favourable seasonal conditions prevailed over the greater part of the sheep pastoral country during the year. At the close of the previous financial year most of the sheep country was well grassed, although the pastures had dried off quickly in the Roma and Goondiwindi districts. Useful falls of rain were recorded at Warwick, Dalby, Roma, St. George, Charleville, Cunnamulla, Blackall and Barcaldine during the first three months of the year under review. Pastures on the Darling Downs and in the Maranoa and Warrego pastoral districts, as well as in the Central-West, responded well. By August, most of the grass in the north-western part of the State was dry. The whole of the sheep country except the far north-western portion received good rains between September and November.

Good rains fell during January, February and March in most of the sheep pastoral districts. As all of the sheep raising areas except Warwick and Dalby had received well above their yearly average during 1954, good grass cover resulted. Further rains occurred in April, and in May the heaviest and most wide-spread rains ever recorded in that month fell over the whole of the sheep pastoral country. Heavy flooding resulted and the continuous rain destroyed much of the grass that was standing over from the summer rains.

Successful lambings have been reported from most districts although extended waves of blowfly activity and worm infestation have caused some losses. Heavy losses also resulted in some districts from cold, wet weather and from floods. However, Queensland sheep numbers have increased and at March 31 the State's flock totalled just on 20 millions. The sale of 588,207 bales of wool returned £A55 million to Queensland. Wool still maintains its premier position as the State's most important earner. It also contributes a greater amount than any other industry to Queensland's oversea's earnings. The wool market has remained firm, but the usual price difference between fine and strong wool has been substantially reduced.

STAFF.

It has not been possible to maintain the advisory staff at its full strength during the year. One graduate Husbandry Officer and a Senior Husbandry Officer resigned to accept positions in other organisations. Two advisory officers also resigned. The vacancy at Longreach remained unfilled and that at Winton was filled only at the end of the year. A Senior Adviser, who has been absent from duty for the greater part of the year under review, was seconded during August 1954 to the Commonwealth for service in Pakistan under the Colombo Plan.

Two temporary Advisers were recruited during the year. One whose appointment was financed from Wool Funds has been stationed at Muttaburra. The other, whose appointment was financed under the Commonwealth Extension Services Grant, is stationed in Brisbane to undertake extension among fat lamb raisers on the eastern littoral.

Two graduates in veterinary science who completed their academic training under the Sheep and Wool Extension Services Scholarship Plan and who joined the staff during 1954 visited southern States to participate in a year of post-graduate training. The Wool Technologist also visited southern laboratories to acquire information about the most modern laboratory techniques that can be used in fleece measurement. The overall shortage of graduate and advisory staff is one of the most difficult problems facing the Branch at present.

EXTENSION WORK.

Extension officers contacted 2,269 woolgrowers during the year, and conducted 662 demonstrations on private properties. Six field days were held and 4 in-residence schools were conducted.

The field days proved useful in publicising new ideas. They were followed by visits by field officers to the properties of woolgrowers interested in pursuing the suggested methods. The field days concentrated upon fodder conservation, fertility, and infertility of sheep, and fleece measurement. Woolgrowers who attended the four in-residence schools were given further training in these subjects during the year.

The first school was organised by the Australian Estates Company on its "Terrick Terrick" property at Blackall. It was attended by 21 members of the Company's staff, including managers, overseers, jackeroos, and senior executives.

The first day of the school was devoted to fertility of ewes and the management of ewe flocks, with a view to selection of lambing performance and decreasing losses of new-born lambs. The second day was taken up with lectures and discussions relating to the male organs of reproduction, temporary and permanent infertility and ways of organising breeding trials. On the third day, lectures dealt with the effects of environmental influences on wool production, and the afternoon was devoted to demonstrations. The fourth day was taken up with methods that could be used to ensure more rapid progress through breeding. Demonstrations placed stress on increasing the accuracy of selection of ewes and rams for use in any breeding programme.

This school appeared to be extremely successful, and was followed by one organised by the Queensland Merino Stud Sheep Breeders' Association and conducted on September 13 and 14 at "Tambo" Station, Tambo. It was designed to acquaint stud-masters with recent advances in sheep breeding, with special reference to the use of fleece measurement.

Two further schools were held for young woolgrowers during April and May. The first was conducted at "Eurella" Station, Mitchell, during the week commencing April 18, and the second at "Barcaldine Downs," Barcaldine, during the week commencing May 23. These schools were financed from Wool Funds and were attended by young men in the 21-30 age group. All of those who attended had sound basic experience in the sheep industry and intended to make their future in it. Application forms were distributed by branches of the United Graziers' Association of Queensland and the Selectors' Association of Queensland, and were printed in *Queensland Country Life* in its normal issue. Twenty-five men were selected for each school and each was given ample opportunity to take part in the demonstrations and to acquire the skills that were demonstrated. In addition, they were asked to open discussions on the information that was presented to them, and to formulate plans for its application.

Those attending the "Eurella" school came from as far west as Eulo and from as far east as Stanthorpe. Those attending the "Barcaldine Downs" school came from as far north as Julia Creek and Hughenden, and from the western limits of the sheep country on the Tropic of Capricorn.

Schools of this type must be regarded as one of the most important milestones in extension work in the sheep area. A survey conducted by the United Graziers' Association had shown that the information extension carries diffuses readily from property owners who employ the most modern methods. It is hoped that the training of young men who are owners or part owners of properties and/or who are largely responsible for the implementation of new ideas will establish reservoirs in each district from which information can be disseminated.

EXTENSION PROGRAMMES.

The extension forces within the Branch have been concentrated during the year on two major programmes —fleece measurement and drought mitigation.

Fleece Measurement in Improving Flocks.

The cut per head of sheep in Queensland has increased steadily during the whole of this century. Fifty years ago the average cut per head of the State's flock was about 6 lb.—today it is 8¼ lb. It is estimated about 1 lb. of this increase is due to better breeding and the remainder to the provision of more watering facilities and subdivision fencing. This represents an average gain of one-third of an ounce of greasy wool per year over the whole of the State's flock.

Queensland has 74 Merino studs which supply two-thirds of all the rams used in this State. The largest six studs supply one-third of all the Queensland-bred rams. Fortunately, the improvement resulting from better breeding in a stud is passed "down the line" to the flocks that buy its rams. Therefore, Queensland's studs are the key to progress in sheep breeding for a large proportion of the State's flocks.

The rate of progress will depend largely upon the accuracy with which the studs select sheep for the characters that are readily transmitted from parent to offspring. That is why a wool laboratory was established in the Sheep and Wool Branch five years ago. It is capable of measuring the fleeces from all the rams required as leading sires in Queensland. Since its establishment stud-masters have learnt to use its facilities and many can now point to the results they have obtained. A threefold increase in the rate of genetic improvement has been obtained.

The wool laboratory does not set out to make a final choice of the sheep selected to be parents. It places in the hands of the stud-masters accurate information about the amount of wool their sheep grow. It tells them, too, how any particular fleece yields, how much clean scoured wool it contains, the length of the staples, and the average thickness and uniformity of the wool fibres. It can also give details about the number of wool fibres each sheep grows on a square inch of skin and the ratio of true wool-growing follicles to hair follicles in the skin. Armed with this information and with the sheep before him the stud-master can make an accurate choice.

The facilities the wool laboratory provides are now being used by 36 studs and flocks. Eleven of the studs are registered. In 1952, they provided 45 per cent. of all the Queensland-bred rams sold. As the result of the genetic improvement they can transmit, something like 3,000,000 lb. of greasy wool could be added to the State's clip each sheep generation they are bred. A conservative estimate on today's market prices could not value this at less than £A1 million.

Mitigation of Drought.

The nutritional problems facing the sheep industry can be divided into three classes:—

(*a*) Absolute drought.
(*b*) Partial drought.
(*c*) Trace element deficiency.

While absolute drought is recognised as the oldest and largest problem facing the industry, comparatively few producers appreciate the importance of partial droughts that occur almost each year. Field studies in the conservation of bush hay have brought this problem into sharper relief. Sheep usually eat about 3 lb. of dry matter per day. This means that animals grazing Mitchell grass in June might get about one-seventh of the digestible crude protein required for maintenance and normal wool growth. Sheep are extremely selective feeders and it is agreed that chemical analysis of the whole plant may not be a real indication of the nutritive value of the diet they enjoy.

On the other hand, there has been a growing realisation amongst woolgrowers that some form of fodder conservation is essential to a solution of their drought problems. There is considerable interest in bush hay, as well as in cropping. About 34 pastoralists are known to be conserving bush hay in the area receiving less than 20 in. of rain and over 28,000 tons of silage were conserved during the year on sheep properties in western Queensland. Most pastoralists realise they will not be able to grow crops every year. However, they argue that the capital cost of the machinery for crop growing is about the same as that for haymaking and that cropping will give a greater weight of nutriments per acre, as well as per pound spent on machinery and working expenses. The basis of their argument can be summarised in Table I.

TABLE I.

Data on Fodder Conservation.

Fodder.	Energy-Producing Material.		Digestible Protein.	
	Lb. per Acre.	Cost per Lb.	Lb. per Acre.	Cost per Lb.
Bush hay ..	370	1d.	8	4s.
Sorghum hay ..	900	¾d.	90	8d.
Sorghum silage ..	1,800	½d.	120	8d.

The extension programme which has been implemented to assist in the conservation of fodder has aimed at helping woolgrowers define their own drought problems and encouraging their interest in seeking their solution. It has also set out to form favourable attitudes towards the conservation of fodder and to show, by method and result demonstrations, how bush hay can be conserved and used.

It has also aimed at encouraging woolgrowers to grow and conserve fodder crops and to help them find the best way to use silage to maintain sheep during drought time. As seasonal conditions were so good, artificial drought conditions were created by confining sheep in yards for silage feeding trials. These revealed that silage could be used for maintaining sheep in drought time, and in one instance ewes that were fed silage lambed successfully.

General.

Besides carrying out these two main programmes, field officers were called upon to advise woolgrowers about a wide variety of general subjects. The most noteworthy of these were:—

(*a*) *Control of Internal Parasites.*—The particularly bounteous seasons led to marked increases in worm populations. Since 1949 seasonal conditions had favoured the survival of parasitic worms of sheep during their free-living stage, when they were on the grass. The winter rains of 1954 allowed re-infestation of the sheep and the pastures made very rapid growth after the summer rains of 1955. This had the effect of concentrating the sheep onto restricted areas; this, in turn, led to a rapid increase in worm infestation.

Unfortunately, many woolgrowers failed to anticipate this, and some serious outbreaks of parasitism resulted. The barber's pole worm was particularly prevalent during the late summer and autumn, and quite heavy infestations of nodule worm also occurred. It is anticipated that trouble from the hair worm will increase as the winter progresses. Field officers have been busy acquainting woolgrowers with systems and management which will preclude increases in worm populations, and in suggesting remedial measures.

(*b*) *Control of External Parasites.*—The body louse of sheep extended considerably into western Queensland between 1949 and 1954. Unfortunately, not many woolgrowers had equipped their properties with facilities for dipping sheep and some failed to recognise the seriousness of the position. The losses due to lice infestation can be serious. Besides being lower in weight, the fleeces from lice-infested sheep tend to be matted and discoloured and as a result command lower prices. The infested sheep are usually lighter than those that are free of lice.

As the result of an extension drive, woolgrowers are showing a greater awareness of their problem, and many in the Cunnamulla, Charleville, Blackall, Longreach, Aramac and Hughenden districts are installing dips.

Two quite important waves of blowfly activity occurred during the year under review. Blowflies were particularly active during October and November, when up to 40 per cent. of sheep in some flocks suffered from body strike. The wave was a little more prolonged than usual. The second wave of blowfly activity commenced in February and extended into March, April and May. During the former wave practically no blowfly activity occurred in the north-west; the second wave was more widespread.

As the result of research work undertaken under the direction of the Joint Blowfly Committee, effective methods were available for blowfly control about 10 years ago. A large amount of extension work was done to carry them to the industry. During more recent years additional insecticides, such as the chlorinated hydrocarbons, became available. During both the fly waves which have occurred during the current year, satisfactory results have been obtained from the use of both aldrin and dieldrin. Property owners report

that these insecticides, when applied as a jet, have given long protection from fly strike, and it is gratifying to observe the rapidity with which the industry is adopting their use.

(*c*) *Land Utilisation.*—Many woolgrowers are giving more careful consideration to land utilisation. The productivity of pastoral land depends largely on the extent to which its natural resources can be developed and husbanded. The recent downward trend of wool prices has focused the attention of woolgrowers on increasing the efficiency of their production.

Most of the costs incurred in wool growing are fixed. Therefore, the most effective way to surmount difficulties arising from falling prices is to increase the productivity of flocks. Fortunately, the economic circumstances which have surrounded the sheep industry since 1946 have permitted the investment of large amounts of capital in pastoral properties. Field officers have frequently been consulted about the effectiveness of various improvements, and they have rendered considerable assistance both to woolgrowers who are anxious to improve their properties and to new selectors.

RESEARCH WORK.

An active programme of research work has been conducted during the year. This has been designed to meet some of the specific requirements of the sheep industry, as well as those of extension programmes. The work has been carried out under an extra-mural grant from Wool Research Trust Funds, as well as on the Toorak Field Station and on private properties.

Wool Research Trust Funds Projects.

Lambing Performance of Ewes.—Factors influencing the lambing performance of ewes have been studied for a number of years. It has become apparent that a large proportion of ewes fail to conceive and may fail to do so for two or three years in succession. In examining reasons for this it was noted that constriction of the vagina was common among the ewes in some flocks.

Breeding trials were conducted during the year to determine the importance of this mechanical impediment to mating. Ninety-four ewes with constricted vaginae were identified on one property. Sixty of these were mated with two rams in a small paddock and 34 (57 per cent.) lambed. The remaining 34 ewes were run with the main mob and mated under normal field conditions. Normal mating procedure in this area involves the use of 2,000-acre paddocks stocked at the rate of about a sheep to 2 acres. Only 14 (41 per cent.) of the 34 ewes mated under these conditions lambed. The lamb-marking percentage for the normal ewes was 59 per cent. Detailed examination of the 94 ewes after lambing showed that 14 still had constricted vaginae. Of these ewes, two had lambed successfully.

Repeatability of Lambing Performance.—Observations on the repeatability of lambing performance, which commenced in 1952, were continued. In this trial, ewes which had lambed under surveillance in 1952 were divided into two groups depending upon their lambing performance. A third group was selected at random from the remainder of the flock, and the three groups were lambed under surveillance in 1953 and 1954. In both years, 68 per cent. of the high-producing ewes have reared lambs to marking, compared with 38 per cent. of the low-production group. The results of the 1954 lambing are summarised in Table 2.

TABLE 2.

Data from 1954 Lambing Trial.

—	High Production Group.	Controls.	Low-Production Group.
Ewes mustered for lambing	40	44	50
Ewes lambed	40	39	41
Lambs born	46	40	45
Lambs marked	38	32	40
Lambs marked as percentage of ewes mustered ..	95	73	80

These results show the superiority of the high-producing group, where 95 per cent. of lambs were marked. Their lambs were also 5 oz. heavier at birth than those of the low-production group.

Repeatability of Birth Weight.—As lifetime records of lambing performance are collected, it is possible to estimate the extent to which the ewes which produce heavy lambs in one year repeat their performance at subsequent lambings. Estimates of repeatability so far obtained range from 12 to 40 per cent. These results indicate that there are real differences among ewes even though the repeatability of these differences is not of a very high order. This is of some importance, as a direct relationship between birth weight and survival has been found in all lambing observations.

Effect on Rams of Variation in Day Length.—In this trial, which began in April, one group of six Merino rams is being run under the normal conditions of decreasing daylight. A second group of rams is being maintained under conditions of increasing day length. The aim of the trial is to determine the extent to which the changes in ram fertility which occur throughout the year can be related to variations in the length of daylight.

Examinations are being made of the quality of the rams' semen as the trial proceeds and these are being supplemented by biological assays of hormone levels in each ram. Wool growth is also being measured, as it has been shown for the British breeds that this is affected by light changes.

Repeatability of Wool Characters.—The repeatability of wool characters is that part of the differences between individuals which is permanent from year to year. Studies have been made of the repeatability of the ratio of primary to secondary fibres and of fibre diameter. From a study of records for four years from a property in the Darling Downs pastoral district, the repeatability of the ratio of primary to secondary wool fibres was found to be 50 per cent.; five years' records for the same sheep showed a repeatability of 40 per cent. for fibre diameter.

It will be necessary to make further observations in other districts during a number of years before any final conclusions can be drawn.

Relation between Fibre Diameter, Crimping and Trade Count.—In a test of crimping as a measure of trade count, 124 wool samples were examined by four classers who independently placed a trade count on each sample. The samples were later re-examined by these classers as a group so that a joint opinion was also available. The percentage of samples on which there was agreement with the later majority opinion is set out in Table 3.

TABLE 3.

Classers' Views on Trade Count.

Classer.	Full Agreement.	Substantial Agreement.
	%	%
1	73	94
2	73	90
3	68	94
4	59	74

Using the joint opinion of the four classers it was found that crimping as measured in the laboratory was about 44 per cent. efficient in predicting trade count. For these samples there was only a poor correlation between fibre diameter and trade count.

Copper Deficiency.—The observations on the supplementation of sheep suffering from copper deficiency, which commenced in 1953, were continued during the current year in collaboration with officers of the Animal Research Institute. Three groups of animals were kept under observation. One consisted of untreated controls, the second was given copper glycinate injections, and the third received copper sulphate drenches. The liver-copper was low in the control group (about 35 ppm). The second group had a slightly higher copper level (about 60 ppm), and the third group contained mainly high-level sheep with liver-coppers of 170 ppm.

The sheep were weighed and the first copper treatment was given in October. The ewe portion of each group was mated for six weeks commencing at the beginning of October 1954. The sheep were crutched and treated again in December. In March the ewes were lambed under surveillance, but no difference in the lambing performance of the groups was observed. The sheep were shorn in June, when fleece weights were recorded.

Classing of Sheep.—In 1953 a number of stud lambs were classed by five classers. The same observers re-examined most of these animals in May of 1954 and a comparison was made of their comments over the two years. It was found that there was only between 53 and 64 per cent. of agreement from one year to the next for any one classer. The extent to which there was agreement among the five classers in 1954 is shown in the following table:—

Number of Sheep Culled by—	
At least 1 classer	111
At least 2 classers	87
At least 3 classers	72
At least 4 classers	56
All 5 classers	36

The correlation between the weaner and 2-tooth wool weights of the sheep used in this trial was also examined. The fleeces from 20 ram lambs were weighed and sampled as weaners, (that is, when 4-5 months of age) and again as 2-tooths, (that is, when about 16-17 months of age). It was assumed for the purpose of this trial that the criterion of selection was clean wool weight. Compared with the results obtained from scouring the 2-tooth fleeces, the selection of the 2-tooth sheep on a greasy wool weight would have been 67 per cent. efficient. Selection on weaner wool weights, either greasy or clean, would have been only 40 per cent. efficient.

Classing of Ewe Flocks.—Thirty-one stud masters who attended the Queensland Merino Stud Sheep Breeders' school at Tambo were asked to select the best 5 sheep on commercial return from a flock of 30 animals. The sheep were shorn, the fleeces were weighed, and samples were scoured after they had been appraised by independent wool experts from wool brokering firms in Brisbane. The five sheep receiving the most votes from the combined classers cut 3.94 lb. of clean scoured wool. The mean value of these fleeces was 787d. The five sheep selected by the most successful classer cut 3.98 lb. of clean scoured wool, and the mean value of the fleeces was 796d. The best five sheep on greasy wool weight cut 4.10lb. of clean scoured wool and the mean value of their fleeces was 795d. The best five sheep on clean fleece weight cut 4.20 lb. of clean scoured wool and the mean value of their fleeces was 821d. The best five sheep on the value of their fleece (that is, on commercial return) cut 4.14 lb. of wool and the mean value of the fleece was 826d.

It was clear that the efficiency of the classers varied considerably. The best classers obtained results comparable with those from selection on greasy fleece weight, but none approached the success obtained from selection on the basis of clean fleece weight or on total value of the fleece. The results from selection on clean fleece weight closely approximated those from selection on value per fleece. Further observations of this type were continued on two properties where sheep were being classed. This gave an opportunity to assess the importance of different faults and the selection differential that can be obtained from different levels of culling. The results from one of these properties are summarised in Table 4.

TABLE 4.

Results of Classing Observations.

Number of Sheep.	Greasy Fleece Weight.	Remarks.
480	6·94 lb.	Whole flock
316	7.20 lb.	Classed in by classer
316	7·31 lb.	Selected by "half-classing"
316	7·41 lb.	Selected on fleece weight only

In "half classing", half the culling is done by the classer, who takes out only those sheep showing conformation faults. The remainder of the culling is done on the basis of fleece measurement. It is clear from the table that fleece weighing combined with visual appraisal can increase the accuracy of selection.

Investigation into Laboratory Techniques.—Investigations were conducted to determine the accuracy of the techniques used in the Wool Laboratory.

Scouring of duplicate samples taken at the time of the shearing of the Toorak flock showed that laboratory yields were normally accurate to within 1.7 per cent. (that is, two-thirds of the samples whose yields were estimated at being 55 per cent. were within the range of 53.3 to 56.7 per cent.). This means that the clean fleece weights calculated for fleeces of say 8lb. greasy weight are normally within about 2oz. of their true value.

Laboratory studies have shown that when two observers each make six counts on a slide containing a thin section of skin stained to show the structure of the follicles, the percentage of primary fibres estimated is normally accurate to within 0.4 per cent. That is to say, two-thirds of the values estimated as 4 per cent. lie within the range of 3.6 to 4.4 per cent.

Measuring duplicate samples of wool showed that the method used in the laboratory for measuring fibre diameters is normally accurate to within 0.4 microns. That is to say, two-thirds of the diameters estimated as being 20 microns would be within the range of 19.6 to 20.4 microns.

Samples of wool numbering 378 which had been examined by a classer who estimated their percentage yield were subsequently scoured at the wool laboratory. The efficiency of different classers in estimating yield did not vary a great deal. The general conclusion was drawn that the visual estimation of wool yield is about 30 per cent. efficient in dealing with individual samples. However, classers are quite efficient in estimating the mean yield of a number of samples.

Feeding Silage to Lambing Ewes.—In a trial on a property in the Muttaburra district, 44 ewes were fed a ration of 5 lb. of silage supplemented with 2 oz. of protein meal. The ration was calculated to provide the ewes with 1½ lb. crude protein and 9½ lb. of energy-producing foods per head per week. Feeding began about a month before most of the ewes were due to lamb and it was continued until weaning.

Forty-one ewes lambed to produce 41 lambs, of which only two failed to survive. There were seven others that probably would have died if the ewes had not lambed under surveillance. Almost all the ewes lost weight after lambing and the protein supplement was increased to 4 oz. when the lambs were about one month old. It was observed that the ewes losing most weight per day were those that recorded the fastest growing lambs. It was concluded that ewes could be lambed successfully on a ration of this type but that it was not sufficient to permit the ewe to maintain condition and to milk heavily. The cost of a ration of this type would be about 1s. for each ewe each week.

Vitamin A Supplementation.—Three observations were made on the value of vitamin A to young sheep.

The first trial, in which there were four groups of lambs each weighing about 47 lb., began in June, 1954. Two groups were fed a supplement and two groups were not given a supplement. In addition, one of each of these pairs of groups was given vitamin A concentrate. The supplementary feeding was of benefit to the first two groups but there was no gain in weight from vitamin A supplementation.

In the second observation, made in the Goondiwindi district, two groups of weaners which originally weighed 43 lb. were given vitamin A supplement during July. No supplementary feeding was undertaken, but when the sheep were weighed again in October those that had received the vitamin A supplement weighed 66 lb. whereas those that had remained as untreated controls weighed only 62.3 lb. This difference is statistically significant.

In a third trial, which was conducted on similar lines, no difference between the weights of the sheep in the two groups was observed. In this observation both groups lost weight.

Toorak Field Station.

Nucleus Breeding Trial.—One hundred and thirty Peppin ewes selected on a combination of characters, including their past breeding performance and their wool production, were mated under surveillance with three rams. They were also lambed under surveillance and records of their lambing performance were kept; 69 per cent. of the ewes lambed successfully. This compared favourably with the remainder of the Peppin flock on the property, in which only 54 per cent. of ewes lambed. Ninety-eight lambs were born to the 90 ewes which did lamb and sires could be determined for 94 of these. Marked differences occurred in the fertility of the rams. One sired 47 lambs and another only seven. About half of the ewes which failed to lamb were served by the latter ram. The 47 lambs sired by the most fertile ram had an average birth weight of 7.7 lb. Thirty-two of these survived to marking and gained an average of 0.37 lb. per day. The third ram sired 40 lambs, of which 30 survived to marking. Their average birth weight was 7.2 lb. and they gained 0.35 lb. per day.

The nucleus flock has been mated again this year and observations will be continued to include the repeatability of lamb performance and of wool production, and the heritability of various characters of economic importance.

Fertility of Rams Treated with Thyroxine:—American work had indicated that the administration of thyroxine, the active principle of the thyroid gland, would assist in overcoming the infertility of rams caused by high atmospheric temperatures. Rams that were treated with thyroxine were joined with 260 ewes belonging to the South Australian and 180 of Peppin strain during the year. The fertility of two groups of rams (that is, those to which thyroxine had been administered and those which had been kept as untreated controls) was compared. The mating commenced in April, 1954, when daily maximum atmospheric temperatures were still over 95°. No advantage resulted from the administration of thyroxine. Conception rates amongst ewes joined with rams treated with thyroxine were about the same as those amongst ewes mated with rams not treated with thyroxine. Similar lamb-marking percentages were recorded from the ewes that had been mated to the two groups of rams. However, large differences occurred between the lambing performances of the ewes from the two strains: 54 per cent. of the Peppin ewes lambed but only 30 per cent of the South Australian ewes. A lamb-marking figure of 43 per cent. was recorded for the Peppins, but only 28 per cent. for the South Australian ewes.

Constricted Vaginae in Ewes.—Observations were made on the vaginae of 696 maiden ewes which were examined during the middle of June, 1954. A half-inch speculum could not be inserted into the vaginae of 75 (10.8 per cent.) of the ewes. Further examination after joining showed that the vaginae of 34 of these ewes were normal and seven subsequently lambed. Three of those whose vaginae remained constricted subsequently lambed. However, the lambing was extremely poor even among the normal ewes and the results are therefore not conclusive.

Milk Yield Trial.—Previous observations had shown that the amount of milk produced by ewes is important in governing the survival and growth rate of lambs. Observations were made during the year on the effect of hormone treatment on the milk production of ewes. Thyroxine, which will prolong lactation in dairy cattle, and Pregnyl, which is reported to ensure a flow of milk immediately after parturition were used. No differences as a result of these treatments were observed.

Various factors influenced the marking weight of the lambs in this trial. They were:—

(1) Birth weight. Each pound that the birth weight of the lamb was above the average of the flock was worth 1½ lb. at marking time.

(2) Time in the Milk Yield Trial. Each day that a ewe was in the milk yield trial added 2 oz. to the marking weight of the lambs.

(3) Age. Each day by which the lamb was older than the average of the group was worth an additional 2½ oz. at marking time.

The results strongly indicate the importance to lambing ewes of adequate nutrition to ensure high milk production and rapid growth rates of lambs.

Drought Feeding Experiments with Bush Hay.—A drought feeding experiment was conducted to find the most effective way of using bush hay. Four groups, each of 20 wether hoggets, were used. The ration consisted of 2 lb. of bush hay, 1 oz. of maize and 1 oz. of meatmeal. Cobalt was added to the ration of one group, vitamin A to the ration of another, cobalt and vitamin A to the ration of the third and the fourth group was given the basic ration only. Cobalt and vitamin A supplement had no effect and all the groups lost weight at about ¾ lb. per week. This is not surprising, as the ration was computed to provide only 5 oz. digestible crude protein and 3 lb. of energy-producing foods per week. As it was considered that a shortage of protein was the limiting factor in the utilisation of bush hay by sheep, a second trial was conducted in which 2 oz. of meatmeal were added to the daily ration of the sheep. Two groups were used. One was given bush hay alone for three weeks and then bush hay plus meatmeal. The second group was given bush hay and meatmeal for three weeks and then bush hay only for three weeks. During the first three weeks the sheep that were given bush hay only began to lose weight, but when the meatmeal was added they maintained their weight satisfactorily. During the second three weeks both groups consumed somewhat more hay than they did during the first period of the experiment.

CATTLE HUSBANDRY BRANCH.

Mr. J. G. Young, Senior Husbandry Officer.

The year 1954-55 was characterised by ample rainfall, with a better-than-average distribution throughout practically the whole of the cattle areas of the State. The winter of 1954, except in an area in the north-west, was one of record cyclonic rains, which were followed by unseasonal soaking falls in the early spring. Eventually, excellent wet-season rains were experienced in the north and north-west and prospects for the remainder of the current season there are particularly good.

Rather dry conditions were experienced in the central and south-eastern portions of the State in the early summer, especially in parts of the Burnett and eastern Darling Downs. However, in March cyclonic rains occurred in practically all portions of the State. Most major river systems experienced sharp rises and extensive flooding followed. Some stock losses occurred, but the greatest privation and hardship occurred in the dairying areas in the near-coastal region from Rockhampton to the border. Crop and pasture losses following inundation and deposition of silt, sand and gravel, and fencing destruction, were very heavy on some properties and have had a marked depressing effect on production in the affected areas. Further flooding has since occurred in these river systems, but on a restricted scale.

As a result of this protraction of the wet season and the good pasture and forage crop conditions experienced during the current winter, beef cattle are expected to grow and fatten well during the remainder of 1955. As was the case last year, the mating season has been favourable. Bulls and cows were generally in excellent condition and it is expected that a good spring calving will follow.

A steady increase in the beef cattle population has been a constant feature of the industry ever since the 1951 drought year. As a result of the good mating and weaning conditions experienced in the last two years, this trend has continued, a record number of 7,225,000 cattle being recorded at March 31, 1955.

GENERAL.

Some staff changes occurred in the Branch during the year. The Officer in Charge since the formation of the Branch in 1948 resigned in the middle of March to undertake private veterinary practice.

An Assistant Husbandry Officer was appointed to replace one who resigned some time ago. The densely settled district of the North Coast and Mary Valley was again left without Branch staff for most of the year due to a resignation. It is, however, now possible to serve this area adequately again and an experienced officer is shortly to fill the vacancy.

It has also been possible to station advisory staff in new centres at Monto, Warwick and Oakey. It was necessary to strengthen the available personnel in several other centres, notably in the Far North (headquarters at Atherton) and at Rockhampton, but also in the south-east of the State (headquarters at Brisbane).

That the services to beef and dairy producers provided by the Branch is appreciated is evident from the growing volume of requests made for advice and assistance. This is especially noticeable in the beef industry and it is a particularly pleasing feature to be able to report.

A successful in-service school of instruction held in February for a period of three weeks was attended by the junior officers of the Branch and also by three of the more experienced and senior officers from country centres. The senior officers supplied not only a large proportion of the technical information, but also invaluable advice to the younger officers on extension methods. This was a particular feature of the curriculum and a large amount of time was spent in demonstrating and discussing such important subjects as field days and demonstrations, visual aids and their use, public speaking, the preparation and presentation of radio scripts and press articles, etc. In addition, each officer attending presented one or more original papers on a technical subject which had involved considerable reading and research in its preparation.

The development of an extensive programme of demonstrations on the properties of producers in both the beef and dairying industries has been a notable feature of the year's activities. This type of extension work, wherein methods and results can be demonstrated by example to a large number of neighbouring producers, has given in most instances a satisfying and worthwhile result. By these methods the field extension officer can contact effectively a larger number of primary producers having similar problems and difficulties than is possible by any other method.

The development of this type of work has been aided by funds available from the Commonwealth Dairy Industry Extension Grant and the Commonwealth Extension Services Grant. Over one hundred demonstrations on the farms of commercial dairymen have been established. They involve such problems as pasture establishment and management, fodder conservation, calf rearing, mineral deficiency and forage crop production. Co-operation between officers of the Divisions of Dairying, Plant Industry and Animal Industry in this work has been intimate.

The growth of discussion groups amongst producers has been an important development of recent years. These groups, called by various names in different districts, comprise men with common problems and much foresight who realise the necessity for community action in their endeavours to raise their standards of primary production. The encouragement of these groups, by attending and participating in their discussions and lectures and by assisting to arrange field days and demonstrations, has been an important aspect of the work of the field officers in the districts where such groups are found.

MINERAL DEFICIENCIES.

Work on surveying and defining areas and seasons of subnormal mineral status, and on evaluating and demonstrating practical methods of therapy, has been continued and expanded in the case of both copper deficiency and phosphorus deficiency.

Copper Deficiency.

On the marine plains of the coast of Central Queensland, there is a comparatively dense cattle population. In most years this country is capable of fattening adult male cattle very rapidly. However, breeding cows and young growing cattle suffer severe loss of condition and deaths are common, especially among the weaners. For many years it was considered that these losses were due to heavy infestations of internal parasites, but a few years ago analyses of blood and liver specimens indicated that the copper status of the animals in the area was extremely low. The administration of copper, in the form of copper sulphate, to affected cattle has produced spectacular improvement in the condition of the treated animals. It has become apparent that in this area, at least, we are dealing chiefly with an uncomplicated copper deficiency. Trials are now being conducted on subcutaneous and intramuscular injection of copper sulphate as substitutes for the laborious oral methods used at first. The results have been so encouraging that it is hoped that a system of strategic treatment may be possible, whereby comparatively massive doses may be given during the year, by injection, as a corrective measure.

In other areas, especially in the near North Coast and South Coast districts, where low liver and blood levels of copper have been demonstrated and proven, these and other methods of copper therapy have continued to give disappointing results.

In a trial in the Mooloolah district, weaner heifers grazed on pastures topdressed with superphosphate, lime and copper sulphate have not shown much improvement in growth rate when compared with heifers of similar age grazed on untreated pasture. On the other hand, the copper analyses of liver obtained by biopsy indicate that the animals grazing the treated pasture have an improved copper status. The liver copper levels

of the heifers in the topdressed paddocks are about borderline to normal, whereas the heifers on untreated pasture have very low liver copper levels. The fact that the copper status of the animals is raised to normal without any marked improvement in condition or growth would indicate that factors other than or in addition to copper deficiency are operating.

A notable feature of this trial was the fact that, despite an apparent abundance of feed, the cattle did not graze normally. Apparently either the grass was unpalatable or the cattle had little or no appetite. Further trials to test the value of mixed supplements, including both phosphates and cobalt, in addition to copper, have been planned.

In some of the copper-deficient dairying areas of the South Coast, some very slight increases in production have been apparent in cows which have received 3 grams of copper sulphate daily in their ration. As is found in so many similar areas, there is a serious inadequacy of good roughage available to the cows, and this more than any other single factor limits the production per cow. As on the North Coast, and again in close co-operation with officers of the Division of Plant Industry, efforts are being made through the use of sown pastures and topdressing to increase markedly the quality and quantity of roughage available. If this can be done, the response to copper therapy may be more apparent.

On other farms on the South Coast, trials have been commenced in which the cows receive both copper and cobalt supplements.

New areas have been found, especially in the Burnett, where the blood copper levels of both beef and dairy cattle are below what is considered to be the normal level.

Phosphorus Deficiency.

Important as copper deficiency is in the cattle industries of the State, an unsatisfactory phosphate status is involved in an even larger area of country and in greater cattle numbers. To a very large extent, the problem in many of these areas is to find practical ways and means of ensuring regularity and sufficiency of intake of the phosphates by the cattle in the area.

In the beef cattle industry, graziers are coming to realise the importance and value of phosphate and its essential role in cattle nutrition and of making greater efforts to overcome its deficiency. Reduction of losses in breeding cows and young growing stock and improved growth rates are obtained in many such areas by a regular programme of supplementation.

A growing number of graziers are distributing licks at watering facilities and other strategic places on their properties. The Department's efforts to popularise the use of the soluble phosphate fraction of superphosphate, as an addition to the drinking water, have been intensified.

Mindful of the need to demonstrate at all times methods that are practical, labour-saving and, if at all possible, universally adaptable, a considerable amount of time has been devoted to the field testing of the Murray phosphometer. The device, hand-made by Mr. T. W. Murray, Inspector of Stock at Gympie, has been under test near Clermont for some time, and analyses of the water available to the cattle indicate its potential advantages in the assault on the phosphate problem. Some minor aspects of a mechanical nature, mainly associated with the deposition of a calcium sulphate incrustation on the moving parts, have been investigated by Mr. Murray and three improved models have been made and delivered for testing. These will be fitted to mills in the Charters Towers district which is the centre of some of the most seriously phosphate-deficient areas of the State.

The use of the soluble phosphate fraction of superphosphate is not dependent on the phosphometer, and for some time this form of phosphate has been under test on a large scale in the Mackenzie River area. A cattle weighing machine has been installed and will be used to give a quantitative measure of the improvement in growth of cows and young stock watered on treated supplies.

The use of phosphatic supplements by dairy cows has been investigated in a series of trials. A significant response in terms of improvement in milk output has not yet been obtained by feeding 2-4 oz. of bonemeal per cow per day in the Toogoolawah area. These trials have only been in operation for a comparatively short time; from Western Australian work it is apparent that the greatest responses might be expected in the second and third lactations after feeding has been commenced.

As in the case of the dairying areas where a low dietary copper status is experienced, the phosphate problem is further grossly complicated by periodic shortages of good roughage.

BEEF CATTLE EXTENSION.

The regular programme of monthly weighing of live cattle has been continued at the several centres throughout the beef areas where weighbridges are available. The primary interest at each station has been to establish on a quantitative basis the normal pattern of growth of cattle at the particular centre. In addition, the opportunity has been taken to evaluate and obtain data on other aspects of management and breeding.

In association with a scale manufacturer, plans were prepared for a fully portable cattle weighbridge. The first has now been completed and is ready for delivery. This machine, which can be towed by a utility truck and quickly prepared for weighing, is a considerable achievement and will greatly increase the scope of important cattle weighing demonstrations and investigations.

The outstandingly important result of the growth studies, considered *in toto*, has been the regularity of the growth rhythm of beef cattle found throughout the State. Where the work has been in progress for several years, the pattern of growth is much the same from district to district and from year to year. Generally speaking, there are four months during which weight losses are recorded—May, June, July and August. This period is followed by a 4-months period of liveweight gain, during which the losses previously sustained are recovered. Further gains in weight are then made in January, February, March and April. Thus, broadly speaking, cattle lose weight for a period of four months and gain weight for eight months with net gains for the season of about four months. Earliness or lateness of the onset of the wet season causes variations of from four to six weeks in the overall pattern.

It is apparent that, if the growing consumer demand both abroad and at home for younger, lighter and better quality beef is to be satisfied, producers must strive for "continuity of growth" in the cattle herds of the State.

That the rhythmic pattern of gains and losses recorded is not inevitable is borne out by the weight observations made on groups of growing and fattening cattle that are given access to forage crops, fodder reserves and improved pastures that are specially produced and reserved for the period when these liveweight losses are normally expected. This type of work in demonstration form is continuing in association with co-operating graziers, and will provide a fruitful extension field for several years to come.

In North Queensland, the growth comparison between groups of Brahman cross and British cattle has been continued. Preliminary data on the same two groups were presented in last year's report. The superiority in rate of growth of the Brahman group has been maintained throughout the trial period. The two groups of animals were recently slaughtered and carcase evaluations are now being made.

At the Brisbane Show in August, 1954, the measurement of stud beef cattle that was commenced in 1953 was undertaken again. On this occasion a weighbridge was available and the linear measurements were correlated with actual liveweights. This enabled a formula to be calculated for the estimation of liveweight of bulls in show condition. In the past, reliance has had to be placed on formulae derived from overseas data. The new formula is $W=38\ (G-46)$, where W is the liveweight in pounds and G is the girth in inches measured in the vicinity of the fifth and sixth ribs.

Selection, the main tool of the breeder for making genetic improvement in his herd, has in the case of beef cattle been mainly qualitative. Objective and quantitative measures in the form of butterfat and milk yields have been available to dairymen for many years. A system of performance recording of both males and females of the breeding herd has been under test for over a year in one or two of the leading stud herds of the State and also at the "Brian Pastures" Pasture Research Station. The aim has been to put beef cattle selection on a quantitative and objective basis. The plan involves periodic classification, scoring and recording of the breeding nucleus of the herd. Such a planned programme is the basis of progeny testing. The system has been so successful that the co-operating owners of the testing studs are planning to make it a part of their breeding policy. Plans are being made now to promote and popularise the system in the stud herds of the State.

Seasonal conditions in the Central Highlands in the early summer were unsatisfactory from the point of view of pasture growth for bush hay conservation. In late February, just when it appeared that there may have been insufficient pasture available for mowing, useful falls of rain were experienced, and these were followed by the heavy falls of March. A late start was finally made and fair samples of bush hay were recently baled. Sufficient extra hay was made to provide the needs of the Animal Research Institute's drought feeding trials at Rocklea. The feeding tests in the Central Highlands planned for last year and abandoned due to the good grazing available are to recommence this year if seasonal conditions permit.

"BRIAN PASTURES" PASTURE RESEARCH STATION.

The work of the two officers of the Branch stationed at the beef cattle research centre in the Central Burnett has now been organised to the stage where a systematic programme of weight observations and herd classification is followed. During the calving season last spring it was possible for the first time to record the birth weights of all calves without the necessity of mustering and unnecessarily disturbing the animals. A system of temporary identification of the calves by means of a light neck chain and identity disc at the birth weighing will now be adopted. Permanent identification and removal of the chains and discs will be done at branding.

In May, 60 cows culled from the breeding herd and spayed in April, 1954, were consigned to the meatworks at Cannon Hill. The average liveweight of the cows at trucking time was 948 lb. and they yielded an average carcase weight of 485 lb., with a dressing percentage of 51.

The monthly weighings once again have shown the same seasonal rhythm that has been apparent at practically all centres where cattle are weighed regularly. Weight losses occurred from June to September. The magnitude of the liveweight losses was between 1 lb. and 2 lb. per day. Recovery occurred and was apparent at the October weighing and has been maintained up to the present.

DAIRY CATTLE EXTENSION.

The infertility survey being made in the dairy herds of the State has reached the stage where as increasing number of completed record sheets are being returned from the co-operating dairymen. The initial distribution of the record sheets according to district of the State was:—

	%
Darling Downs	20
Moreton	30
Burnett and Wide Bay	30
Central Coast	10
Atherton	10

In all, about 300 dairymen are co-operating effectively in the survey, and interpretation and analysis of the data have begun.

Specialised investigations in herds affected by infertility problems have been made during the year in association with the Animal Research Institute. The control programmes in trichomonad-infected herds have been carefully studied, and satisfactory progress continues in a part of the Beaudesert area where an outbreak had previously been diagnosed.

Vibriosis now has been shown to be much more widespread in dairying areas than was at first suspected. Outbreaks have been recorded in all major districts. Investigations into methods of diagnosis, control and treatment are being carried out.

The supplementary feeding demonstrations commenced in four herds on the Atherton Tableland in 1953 are continuing. The cows in each herd have been paired according to age, previous production and calving time, and all are fed a basic roughage ration as far as possible adequate in quality and quantity. To one of each pair is fed in addition a concentrate supplement at a rate dependent on current production. Sufficient completed lactations are available in only one herd as yet, and in this case preliminary comparisions indicate a significant difference in favour of the group receiving the supplement.

The Cattle Husbandry Branch has been associated with Branches in the Divisions of Dairying and Plant Industry in the establishment of a considerable number of demonstrations financed from the Commonwealth Dairy Industry Extension Grant. Methods of pasture establishment under both irrigation and natural rainfall conditions, pasture management methods, strip grazing of pastures and forage crops, silage making, and the results to be obtained from such practices, are especially being demonstrated.

A large number of field days, tours and inspections, together with the associated lectures and discussions, have been organised in relation to these projects and will continue as the interest of the dairymen in these methods develops.

CATTLE HUSBANDRY WORK ON REGIONAL EXPERIMENT STATIONS.

Biloela.—Facilities for the management of an experimental dairy herd at the Station were completed late in the year. A nucleus of heifers of the Australian Illawarra Shorthorn breed is now being purchased as foundation stock.

Kairi.—In March, the end of the statistical year, the herd composition was dry cows 3, bulls 2, cows in milk 37, yearlings 13, and calves 17, making a total of 72.

Mating was recommenced in late November, using principally the bull "Boree Effort's Comet" (the option of repurchase having been exercised) and to a lesser extent the young bull "Connemara Sapper." Initial matings were by artificial insemination and all returns to service were mated naturally. Difficulty was experienced in getting the cows to hold to service and subsequent pathological examinations indicated an outbreak of vibriosis in the herd. Mating was immediately discontinued and a treatment and control programme put into operation. Mating is expected to recommence at the normal time in November 1955.

This outbreak is the only case that has come to notice in the dairy districts of the State where the complete history of each cow is available and where facilities exist for continuous observation and examination of specimens. The position at the Station is not complicated by other reproductive diseases such as brucellosis. In addition, the plane of nutrition and the mineral status of the herd are known to be good. In view of these factors, the opportunity is being taken to study fully the course of this disease, which is now known to be wide-spread in the dairying areas, and also to test the efficiency of control and treatment measures.

The herd at the Station is producing at the rate of approximately 217 lb. of butterfat per lactation. This is an average for all cows in the herd, including heifers. When converted to a mature equivalent, the production is approximately 246 lb. This production level is achieved without the use of concentrates for the cows on second and subsequent lactations. Heifers are fed during their first lactation 3 lb. per day of a mixture of three parts of sorghum and one part of meatmeal. Otherwise the herd is maintained on pasture, forage crops and conserved roughages. The production level is 70-80 lb. of butterfat in excess of the Tableland average for spring-calving cows.

Maize silage is the main conserved roughage that is fed to the cows. Its feeding is restricted to the late spring and early summer period and it is fed at a rate of about 30 lb. per head per day.

PIG BRANCH.

Mr. F. Bostock, Officer in Charge.

Climate conditions varied throughout the main pig producing areas. In North Queensland conditions were far from average. A comparatively dry spring was experienced, with a very late monsoon, rains being delayed until February, when considerable flooding occurred. In the Burnett, an unusual feature of the weather was the occurrence of four floods, which greatly hampered the movement of pigs and made conditions very unpleasant.

On the northern Darling Downs, and in the Moreton and Central Queensland districts, above-average rainfall was registered and resulted in local floodings. In the Warwick district conditions toward the end of the winter of 1954 were very dry, particularly in the area between Warwick and Inglewood. Early spring rains assisted, but unfortunately were followed by a dry spell; however, rain during April and May ensured good winter grazing and benefited cereal crops.

Seasonal conditions have greatly influenced feed supplies, particularly in the case of maize in North Queensland, where due to late plantings followed by considerable rain crops will be lighter than average, with the possibility of a larger percentage of pinched grain.

In Central Queensland, grain supplies were ample throughout the year, but in the Burnett area good stocks of grains held at the beginning of the year were soon depleted owing to poor wheat crops, the result of dry weather in May and June of the previous year and heavy floods in July.

This was followed by the failure of the early summer grain crops as a result of dry weather, but late summer grain crops did particularly well in some districts. However, the prolonged wet conditions and lack of sunlight towards the harvesting period resulted in reduced yields, so grain supplies are at present limited and it is doubtful whether pig production will be maintained at the normal level, until harvesting of winter cereal crops in November. Producers will be forced to purchase grain to maintain production. On the Darling Downs and in the Moreton district, feed grain has been adequate.

Protein meals have been available in fair supply in all districts and have met the needs of the pig industry except in North Queensland. Representations have been made to Queerah meat works regarding the installation of a plant to manufacture meatmeal and bone flour and it is anticipated that the erection of suitable plant will be commenced within a few months.

Dairy byproducts were in ample supply in all districts except the Coalstoun Lakes area. Here production has declined, with a corresponding reduction in pig raising, due to many farmers turning to the growing of peanuts as a main source of income. In the Gympie area, skim-milk for pig feeding is decreasing owing to the increasing demand for wholemilk for processing.

Green feed and forage crops were available in varying supply in all districts.

PRODUCTION.

Pig production increased during the year, the total number forwarded for slaughter being in the vicinity of 430,000, compared with 417,360 for 1953-54.

During the year, as in many past years, the attention of producers was drawn to the enormous loss sustained by the industry as a result of the production and marketing of overfat pigs. This matter came to a head when our main export outlet, the United Kingdom, expanded its home pig industry and finally placed an embargo on the import of all pig meats which did not grade first quality. Even the canned trade, which had proved such a boom to the industry and kept prices high, was seriously affected. Processors and exporters found themselves with large quantities of overfat pig products on their hands and no market in which to sell them.

With virtually no export outlet available and local sales at a low ebb, due in some measure to a disregard of the quality of the bacon and ham offered to the consuming public, processors had no alternative but to reduce the price paid to the producer for his pigs, to emphasise that no longer would top prices be paid for overfat pigs, and to consider grading all pigs. However, with no uniform grade standards available, the industry was in a state of confusion and it was realised something would have to be done to again place the industry on a sound basis.

At this stage the Australian Pig Society called a conference of representatives of Australian pig producers and processors to consider the matter of grading. With the assistance of this Department a plan for grading on a Commonwealth-wide basis was prepared and adopted. Uniform grade standards were set up, and it was agreed that such standards should be implemented throughout the Commonwealth and that premium payments would be made on all prime and first quality pigs slaughtered for processing.

This grading system, together with payment for quality, was immediately put into operation in Queensland. It conformed very closely to the scheme which has successfully operated on the Northern Tablelands for a number of years.

With the co-operation of all processors of pigmeats, the scheme has been responsible for an improvement in quantity since its inception, lifting the percentage of prime pigs forwarded to market from the 10 per cent. (approximately) which was the general rule to approximately 75 per cent. in a very short space of time. It is confidently expected that this figure will be improved, as was the case in North Queensland.

With this remarkable improvement in the quality of the pigs marketed, Queensland housewives can now buy bacon and ham conforming to consumer requirements. Reports received from processors indicate a marked improvement in the sale of bacon and ham, consequent upon the improvement of carcase quality.

At the commencement of the year bacon pig prices in southern Queensland ranged from 2s. 2d. to 2s. 4d. per lb. dressed weight, but after the collapse of the export market dropped to 1s. 3d. to 1s. 5d. This caused consternation within the industry. However, as quality improved under the influence of grading, prices have risen during recent months to 1s. 11d. to 2s. per lb. dressed weight. In the Northern Pig Marketing Board's area prices have followed the trend in Southern Queensland during the year.

STUD SALES.

Reports received from field officers of the Branch have indicated that the demand for breeding stock and stores fluctuated in accordance with the markets.

Commercial breeders are realising more than ever the advantages of using purebred stock. No doubt the introduction of grading has played a considerable part and as a result there was increased enquiry for blood lines to improve farmers' herds.

The Royal National Association and country show societies have continued the policy of stipulating that only stock from brucellosis-tested herds will be accepted for exhibition, thus providing an opportunity for farmers to purchase sound breeding stock and enable breeders to compare their pigs without risk of exposure to this disease. Requests for the services of Branch officers in selecting breeding stock are increasing, not only at shows but also on breeders' properties, and this service is much appreciated.

As pointed out in previous years, the selection of breeding stock on conformation or general appearance alone is by no means a guarantee that such animals will produce stock suitable for present-day market requirements. This has been emphasised by the results of grading, many farmers being surprised at the grade into which their pigs have fallen on slaughter.

Sketches were submitted during the year to enable plans to be drawn for the building of a Test Station at Rocklea, which it is hoped will be established at an early date. Such a station would do much to improve the standard of the State's breeding pigs. Results secured from this type of work would make available to breeders information relating to utility factors, such as the commercially important features of weight for age at slaughter, food conversion efficiency and carcase quality.

CARCASE COMPETITIONS.

The Australian Meat Board in association with the Department and with the co-operation of all sections of the industry conducted baconer carcase competitions on a district basis for the eighth successive year. Judging was carried out as usual at Mareeba, Rockhampton, Brisbane and Toowoomba.

The State championship was awarded to a pig sired by a Large White boar out of a Large White X Berkshire sow bred in the Moreton district. The carcase of 140 lb. dressed weight was awarded 91½ points, only ½ point below the record score secured last year. It was a very nicely proportioned carcase, scoring well in all points.

The field days which it has been customary to conduct in association with the judging were limited to three centres, Brisbane being excluded because of the poor attendance of farmers in past years. Arrangements were made for the winners of the Brisbane competition to be exhibited at the Toowoomba field day. There was a good attendance of farmers at each of the field days.

Entries were slightly higher than in the previous year. The general quality of the entries as a whole was good; the overall percentage (75.78) is the highest yet recorded and is a very creditable effort. A pleasing aspect was the absence of the overfat carcase, for while there has been a progressive improvement in this section over the years there have hitherto always been some overfat pigs coming forward from one or other of the districts. This year, overfatness was conspicuous by its absence in all districts.

The Hammond system of carcase appraisal was again used for judging. To qualify for entry the pig must have been sired by a purebred boar and the dressed carcase weigh not less than 120 lb. and not more than 160 lb.

Cured baconer carcase competitions were again popular with country shows, with an increased number of societies including the competition in their schedules. Entries were reported to have increased, especially in the Morteton, Burnett and Central Queensland districts.

Since the introduction of grading there has been some criticism of all carcase competitions and the opinion expressed that they were now of lesser value than heretofore. While this may be true concerning the chilled carcase competitions, where only a limited number of producers throughout the State compete or can attend the field days, it is submitted that this is not true of the cured baconer carcase competitions.

Because of the increased number of show societies now catering for these competitions, a large number of producers are entering pigs, and with the finished product (cured sides) exhibited together with the score-card at the local show, keen interest is created. The competitions are providing a very useful means of demonstrating to producers, who would not otherwise be able to see the quality of the article produced from their pigs, the type of carcase required by the trade and affords them an opportunity of comparing their results with those of other producers.

Many of these producers would not have an opportunity of visiting a bacon factory or meatworks to inspect the carcases of their pigs forwarded for slaughter. This type of competition is affording the progressive farmer the opportunity of learning at first hand just where his pigs are at fault, thus providing the information which will enable him to improve his product.

REGIONAL EXPERIMENT STATION PIGGERIES.

The stud herd of Tamworth pigs at Kairi Regional Experiment Station has been maintained. Developmental work included the construction of self-feeders for suckers and growing pigs, a new set of drafting yards weighing shed, and building of a circular farrowing pen with concrete feeding floor attached. Farrowings in this new pen to date indicate as was the case with the experimental pen used last year, that it is likely to prove superior to the conventional farrowing pen for the first 4-5 days of the young pig's life. Such pens, it is hoped, will be the means of considerably reducing the State's annual loss of suckers during the period from birth to weaning; at present this approximates 20 per cent. of all pigs born.

A trial to determine the amount of molasses which may replace grain in the ration fed to pigs without detriment was completed. Results indicated that molasses feeding in amounts up to one-third of the total ration was feasible, with no ill effects such as scouring occurring provided adequate fibre was fed.

All pigs fed molasses drank more water than the control pigs. When the level of molasses was 20 per cent., pigs drank approximately one-third more water than the controls and when the high level of 30 per cent. was fed, water consumption was approximately 50 per cent. greater. Rates of food conversion per lb. liveweight gain were fairly close for all groups when molasses is converted to grain equivalent. There was no significant difference in the quality of the carcases produced and economically the high-rate molasses ration is favoured by price. A further test will be carried out as opportunity offers.

Several deep litter trials were carried out. The results were promising but were considered inconclusive, as the type of building employed was not suited to the purpose.

Arrowroot and sugar-cane were used extensively for the grazing of forward stores and for finishing baconer pigs. Some interesting results were obtained from the grazing of pigs on *Glycine javanica* and arrowroot combined. This work is being continued as suitable stock becomes available. It is thought that as a result of the wider use of suitable grazing crops the quality of the pigs forwarded for slaughter will be improved, resulting in the marketing of a greater percentage of prime quality baconers at considerably higher weights than are being obtained at present.

At the Hermitage Regional Experiment Station a Berkshire stud has been established by the purchase of a boar and three in-pig sows. As a result of a litter reared from one of the original sows purchased, the breeding stock now numbers 1 boar and 9 sows.

Young stock are not yet available for experimental work, but as opportunity offers it is proposed to conduct a number of grazing trials until such time as suitable pens are available to permit more detailed work. Additional farrowing pens are required if the present number of breeding sows is to be maintained.

Piggery buildings and yards have been completed at the Biloela Regional Experiment Station and a boar and three in-pig Large White sows have been purchased to form the nucleus of a Large White stud. Selections will be made of sows from litters reared to increase the number of breeding stock.

GENERAL.

Work in the Moreton area in connection with the Commonwealth Extension Services Grant has been continued. However, due to shortage of building materials, especially roofing iron, progress has been slow on the four properties on which grazing demonstrations are being conducted. Each of the properties now has good grazing and portable shelter sheds available for growing stock and dry sows. Automatic drinking bowls, self-feeders and electric fence units have also been provided.

Good results have been obtained from grazing lucerne and annual crops, especially with regard to the saving of skim-milk and grain in the rations fed to dry sows.

Two deep litter demonstrations were completed during the year and aroused considerable interest among farmers, particularly small crop growers with restricted areas for the running of livestock. The manurial value of the litter has been estimated to be 23s. per pig from weaner age to baconer weight of 140 lb. dressed.

However, it is realised that the analysis of deep litter will vary considerably according to the type of feed and the management employed. A trial has been arranged, in co-operation with the Horticulture Branch, to determine the effect of deep litter on the soil and to ascertain the manurial value when used in the growing of small crops. Some difficulty was experienced in obtaining sufficient sawdust for the trial in the Ormiston district, and this would appear to be the main deterrent to the general use of the deep litter system of pig raising in the Redlands area.

A project using supplementary meal with garbage feeding was established to demonstrate the value of the practice, but unfortunately owing to lack of suitable accommodation segregation of trial pigs was not at all times possible.

Work on two selected properties, one on the Atherton Tableland and the other in Central Queensland, has unfortunately been hampered by lack of building materials. However, it is expected that feeding and grazing demonstrations will be commenced early in the New Year.

Brucellosis testing of stud herds has been continued in conjunction with the Veterinary Services Branch: 104 herds have been issued with appropriate certificates and placed on the list published in the *Queensland Agricultural Journal* each month. A further five herds have entered the scheme, but have still to complete the necessary tests.

The health of stock has been generally satisfactory and disease was not a serious problem, but owing to the excessively wet conditions experienced in several districts respiratory diseases have been responsible for some losses and the incidence of worm infestation has increased. Generally, such losses were caused by lack of adequate accommodation and faulty nutrition.

Leptospirosis has been reported in the Moreton and Darling Downs areas. Investigations into this disease are still being made at the Animal Research Institute, Yeerongpilly. Sparganosis was detected in pigs from several properties on the Atherton Tablelands, Ingham and Central Queensland areas. Salmonella infection and Glasser's disease continue to be responsible for moderate losses on many properties.

POULTRY BRANCH.

Mr. P. Rumball, Officer in Charge.

Despite the low export values on the United Kingdom market, which reduced the annual average net return to growers, there has been a decline of only about 4.3 per cent. in the intake of eggs by the South Queensland Egg Marketing Board. The decline almost parallels a corresponding decline in the production of pullet day-old chickens in southern Queensland. In central and northern Queensland, where production is absorbed locally, there has been a marked upward trend in egg production.

It was thought that the reduced level of profitability due to low overseas values would cause a drastic decline in the industry. However, such has not been the case, producers having reduced production costs by feeding increased quantities of sorghum in place of wheat, by more rigid culling, and by stocking their farms with a greater percentage of pullets than has formerly been the case.

With the increasing popularity of the Australorp-White Leghorn cross for egg production, interest is being displayed in the raising of the crossbred cockerels for table purposes. These cockerels in some instances are being raised to the age of eight weeks, in others to 12 weeks. At these ages, the crossbred dresses attractively and has an economic food conversion rate. In addition to poultry raisers, a large meat processing firm in Maryborough has embarked on a broiler production programme and is finding a ready market for its output. This firm is paying particular attention to the presentation of the product and is one of the first to market broilers in a vacuumised pack.

RANDOM SAMPLE PRODUCTION TRIAL.

The first random sample production trial in Queensland was commenced in August at the poultry section of the Department's Rocklea Animal Husbandry Research Farm.

Owing to limited accommodation, the trial had to be restricted to eight entries. It is pleasing to report that 25 persons engaged in the business of hatching chickens for sale made application for entry. For the trial, hatching eggs were drawn at random from those about to be set by hatchery owners. They were incubated at the Rocklea Farm and the pullet chickens then reared to maturity (18 weeks).

Points are allotted for hatchability, rearability, egg production and livability. Out of a maximum of 1,500 points which could be scored up to the age of 18 weeks in various groups, the points which have been awarded range from 1,274 to 1,351.

Of the 405 day-old pullet chickens placed in brooders, only 12 (less than 3 per cent.) died in the first 10 weeks of life. At 10 weeks of age, groups in excess of 45 were reduced to this number by random selection. This left 349 to be reared to 18 weeks. During the final 8-weeks period, only 3 birds (.86 per cent.) died. Inasmuch as the stock came from eight different farms, the trial indicates that all deaths which occur in raising chickens are not due to inherent weaknesses but that faults in husbandry methods take a heavy toll.

At 18 weeks of age, each group was reduced by random selection to 30 birds for the egg production section of the trials, which will end in January 1956.

EXTENSION WORK.

Officers of the Branch paid over 3,400 visits to farms for the purpose of extension work, conducted 572 demonstrations for individual farmers or groups of farmers, and addressed 53 gatherings.

In addition to this, field officers have given advice on disease control to farmers on 1,389 occasions, on nutrition on 1,910 occasions and on general husbandry subjects on 1,929 occasions.

It is interesting to record that enquiries were received from no less than 84 persons wishing to engage in poultry raising—in most instances as a means of livelihood.

Articles have been published in the *Queensland Agricultural Journal* dealing with the use of sorghum for laying fowls and chickens, untilisation of maize in the rations of layers, incubation, and the maintenance of egg quality. In addition, a booklet on the raising of chickens has been prepared for publication under the Commonwealth Extension Services Grant.

COMMONWEALTH EXTENSION SERVICES GRANT.

During the year, four types of demonstrations were commenced under the Commonwealth Extension Services Grant. These were spread over 16 farms. Five farms undertook sorghum feeding demonstrations; three vitamin A supplements for layers; one, winter lighting demonstration to increase winter production; and seven, the use of laying cages with the object of recording production of potential breeding females.

Sorghum Demonstrations.

These demonstrations consisted of feeding equal numbers of laying hens sorghum or wheat as the grain portion of their ration. The egg production per hen on a "hen-housed" basis for the four demonstrations conducted in 1953-54 and for the present year showed that there was very little variation in production between groups fed sorghum and wheat respectively. The production per bird on one farm was outstanding and indicates that there is considerable scope for a general uplift in the productivity of some flocks if improved husbandry methods are practised.

Vitamin A Supplements.

These demonstrations were conducted on three farms during the year. On all farms, birds of similar age and quality and housed under similar conditions were fed greenfeed. However, one group on each farm was supplied in addition with a vitamin A supplement.

It was found that all these supplemented groups gave a higher output per bird than those fed greenfeed only. On Farm A, the greenfeed was of choice quality and fed at the rate of 6-10 lb. per 100 birds; on Farm B, 6 lb. of lucerne per 100 birds was fed; on Farm C, 6 lb. per 175; whilst on Farm D, greenfeed consisted of small-crop wastage. The demonstration indicated that vitamin A supplements are necessary when greenfeed is of poor quality or is not fed in adequate quantities.

Other Demonstrations.

Demonstrations of winter lighting and the use of laying cages on breeding farms are in progress, but are not sufficiently advanced for comment.

EXPERIMENTAL WORK.

Antibiotic Feeding.

During the year under review, one antibiotic feeding trial was carried out at the Rocklea Animal Husbandry Farm. This experiment was a repetition of the trial conducted at the Kairi Regional Experiment Station in 1953, where the effect of buttermilk powder in a chick mash on the growth-promoting action of procaine penicillin was investigated. The ration schedule and results of this work were recorded in last year's report.

In the 1954 experiment, cockerel chicks were obtained as day-old and housed in a battery brooder for one month, when they were transferred to follow-on rearing cages. The test terminated after eight weeks. Procaine penicillin was added at the rate of 15 grams per short ton to two of the experimental rations.

Table 1 sets out the percentage weight increases due to the addition of penicillin to chick mashes with and without buttermilk powder.

TABLE 1.

LIVEWEIGHT OF CHICKENS FED RATIONS INCLUDING BUTTERMILK POWDER AND/OR MEATMEAL WITH AND WITHOUT PENICILLIN AS A SUPPLEMENT.

Ration.	2 weeks.	4 weeks.	6 weeks.	8 weeks.
*M.M. + R.	3·2 oz.	8·3 oz.	16·7 oz.	27·8 oz.
M.M. + R. + P.	3·9 oz.	9·3 oz.	19·2 oz.	30·1 oz.
Per cent. weight increase of penicillin supplemented group	21·9	12·0	15·0	8·3
**M.M. + B.M.P.	3·5 oz.	8·7 oz.	17·5 oz.	28·2 oz.
M.M. + B. M.P. + P.	3·7 oz.	8·7 oz.	18·2 oz.	29·7 oz.
Per cent. weight increase of penicillin supplemented group	5·7	0	4·0	5·3

Key—

*M.M. + R. = Chich mash with meatmeal, synthetic riboflavin.
M.M. + R. + P. = Chick mash with meatmeal, synthetic riboflavin + penicillin.
**M.M. + B.M.P. = Chick mash with meatmeal, buttermilk powder.
M.M. + B.M.P. + P. = Chick mash with meatmeal, buttermilk powder + penicillin.

The results obtained from this experiment did not confirm findings of the previous year, when it was noted that the greatest response occurred when penicillin was added to a mash enriched by buttermilk powder. In this experiment, procaine penicillin had a very marked effect on the growth of chickens fed a poorer type of ration. Penicillin did not appear to have the same effect when fed in association with a protein of high biological value.

In view of the lack of agreement in the experimental findings, it wil be necessary to repeat this work again at the Rocklea Animal Husbandry Farm.

Sorghum Feeding Experiment (Chickens).

Two further experiments were carried out at the Rocklea Animal Husbandry Farm during 1954, making a total of four since sorghum feeding trials commenced towards the end of 1953.

The rations fed in this series of tests, the average net gain in weight from day-old to 12 weeks of age for all experiments, the "food to gain" ratio, and percentage deaths are shown in Table 2.

TABLE 2.

SORGHUM FEEDING EXPERIMENT—EXPERIMENTAL RATIONS.

Ingredient.	Group 1.	Group 2.	Group 3.	Group 4.
	Lb.	Lb.	Lb.	Lb.
Wheatmeal	60	40	20	..
Sorghum meal	..	20	40	60
Bran	22	22	22	22
Meatmeal (55 per cent. protein)	13	13	13	13
Livermeal	4½	4½	4½	4½
Salt	½	½	½	½
	100	100	100	100
Supplements.				
Synthetic Riboflavin (milligrams)	160	160	160	160
Manganese Sulphate (grams)	16	16	16	16
Fish Oils A and D_3 (oz.)	2	2	2	2
RESULTS OF FEEDING.				
Average Net Gains over 4 trials (oz.)	53·39	53·51	52·99	51·87
Average Feed to Gain ratio	3·34	3·31	3·38	3·54
Deaths (per cent.)	8·1	6·2	3·1	8·1

It may be concluded from these experiments that (1) chickens can be fed sorghum meal at the rate of 60 per cent. of the ration without adversely affecting growth; and (2) the mortality on rations containing a high sorghum content is no greater than on rations with a high wheat content.

Breed Production Experiment—2nd year production.

At the conclusion of the 1st year breed production experiment with purebred White Leghorns, Australorps and White Leghorn x Australorp crossbreds, the numbers were reduced by culling to 90 per group.

Table 3 gives the number of hens, the hen-housed average production, the feed required to produce a dozen eggs for the second year of production, percentage deaths, and a comparison of the average production, feed efficiency and deaths for all breeds for the first and second years of production.

TABLE 3.

BREED PRODUCTION EXPERIMENT—SECOND YEAR PRODUCTION.

Breed.	Number of Birds.	Hen Housed Average Number of Eggs.	Feed Required per Dozen Eggs.	Percentage Deaths.
			Lb.	
White Leghorns	90	122·5	8·4	15·5
Australorps	90	89·7	11·1	13·3
Crossbreds	90	109·5	9·7	14·4
Average for all breeds (2nd year)	..	107·2	9·7	14·4
Average for all breeds (1st year)	..	157·7	6·6	13·3

The difference between average food requirements per dozen eggs for 1st year and 2nd year birds in this experiment was 3.1 lb. If the cost of mash is calculated at 3½d. per lb., then the cost of producing a dozen eggs in the second year of production is increased by 10.8d.

These figures confirm the generally accepted belief that pullet flocks are more profitable than flocks containing a substantial proportion of birds in their second year of production.

Free Choice Feeding for Layers.

The object of the experiment is to see whether birds fed mash and grain free choice will eat more grain in relation to mash as the protein content of the mash is increased. This may reduce feed costs.

A total of 270 Australorp pullets was randomised among 18 pens each of 15 birds. Six pens were then fed one of three mashes with protein contents of 17.5, 22.5 and 27.5 per cent. respectively, with whole wheat freshly available at all times.

The results after 20 weeks show that birds have a distinct preference for grain irrespective of the protein content of the mash. In all three groups, the birds appear to be eating two parts of grain to every one part of mash. However, as the experiment has several months to run, there is a possibility that a bigger difference will be found in grain consumption.

TENTH WORLD'S POULTRY CONGRESS.

Mr. F. N. J. Milne, Husbandry Officer attached to the Branch, attended the Tenth World's Poultry Congress at Edinburgh in August, 1954. After the Congress, he visited research and production centres in Scotland, England, Denmark and Holland. Half of the funds for this overseas tour were made available from the Commonwealth Extension Services Grant and half from the Poultry Industry Fund.

Since Mr. Milne's return, he has given 21 illustrated talks to groups of poultry raisers in all the major egg producing areas of the State, and five radio talks.

POULTRY STOCK SUPPLIERS.

During the year 206 registrations as stock suppliers have been made under *"The Poultry Industry Acts, 1946 to 1950,"* as compared with 207 last year. Of these 153 were for the business of hatching chickens for sale, 41 for the business of supplying fowl eggs for hatching, and 12 for the business of a poultry dealer.

CHICK SEXING.

During the year three examinations were held for persons applying for chick-sexing licenses. One obtained a pass entitling him to a "license first class" and two qualified for a "license second class". Twenty-four persons renewed licenses.

Table 4 sets out the number of chickens sexed for the years 1951 to 1954.

TABLE 4.

NUMBER OF CHICKENS SEXED.

1951.	1952.	1953.	1954.
2,411,621	1,921,276	2,699,857	2,564,706

DISEASE AND PEST CONTROL.

From an examination of field officers' monthly reports it is evident that the leucosis complex, intestinal coccidiosis and fowl pox are the major and most widespread causes of losses in commercial poultry flocks.

More cases of fowl pox were reported than in the previous year, but as 107 demonstrations on preventive vaccination were given, a reduction in the incidence of this trouble is expected.

The number of cases of vitamin deficiencies was about half that of the previous year. It appears that farmers are appreciating the need for vitamin supplements. The reduced number could be partly due, also, to the wider use of "stabilised" vitamins by manufacturers of poultry mashes.

Although only 24 outbreaks of bluecomb were reported, heavy losses occurred in laying pullets on several large farms in the metropolitan area. This disease is receiving the close attention of an officer of the Veterinary Services Branch.

Pullorum Disease.

Pullorum testing has been completed for 139 stock suppliers who had collectively 207,360 fowls. Of the 139 flocks tested, 46 were clean, 64 had from .01 to .5 per cent. reactors, 16 from .6 to 1 per cent., 6 from 1 to 1.5 per cent., 2 from 1.6 to 2 per cent., and 5 from 2.1 to 3 per cent.

A section of the industry is of the opinion that the incidence of this disease has been reduced to a level at which control methods could be modified. Such action would not be sound, as any marked reduction in testing would lead to a resurgence of the disease.

Stickfast Flea.

During the year, further outbreaks of stickfast flea occurred at Glenore Grove, Tannymorel and Townsville. In the Townsville area, the flea has been found on 23 properties in the residential areas and eight in outer areas. Only a limited survey has been made, due to excessively wet conditions, and it is possible that the infestation is more widely spread.

POULTRY MEAT PRODUCTION.

As will be seen from Table 5, the total number of poultry slaughtered in the Brisbane area was the lowest for five years. The largest decline was in cockerel meat, despite the interest being displayed in the production of broilers.

Throughout the year, prices for hen meat ranged from 1s. 3d. to 1s. 6d. per lb. liveweight, and for cockerels from 2s. 2d. to 2s. 6d. per lb. The higher prices were realised as the festive seasons approached.

TABLE 5.

SLAUGHTERING OF POULTRY—BRISBANE AREA.

——	Cockerels (Chickens).	Hens (Broilers).	Total Slaughtered.
1950–51 ..	483,876	556,493	1,158,920
1951–52 ..	574,886	637,372	1,307,095
1952–53 ..	206,101	328,315	613,844
1953–54 ..	240,049	311,444	604,725
1954–55* ..	129,405	328,854	458,259

(Source—Brisbane Poultry Abattoirs.)

* Subject to revision.

POULTRY ADVISORY BOARD.

This board, on which the Branch is represented, met upon three occasions. The business dealt with included consideration of a programme for experimental work to be conducted by the Poultry Branch; amendments to the conditions governing the conduct of the next random sample production trial; and the estimates of the Poultry Branch, including the precept to be issued upon marketing boards and charges for pullorum testing and vaccination for infectious laryngo-tracheitis to be made by the Department.

STAFF.

During the period under review three cadets, all diploma holders of the Queensland Agricultural High School and College, were appointed to the staff. One of these, however, resigned shortly after appointment. In addition, one adviser resigned to take up a position with a private firm and one inspector resigned to engage in business on his own behalf.

DIVISION OF DAIRYING.

FIELD SERVICES BRANCH.

Mr. F. C. Coleman, Director of Field Services.

With the exception of a few rainless weeks of hot weather during the latter part of December and throughout January, the year was characterised by beneficial rains. Conditions were therefore satisfactory for milk production throughout most of the dairying districts of the State. Prospects for the remainder of the winter continue bright.

DAIRY PRODUCTION.

Butter.

Production of butter reached the satisfactory total of 45,915 tons. This amount exceeds last year's total by 10 per cent.

The trend of quality, which had been downward for the previous 12 months, was arrested; 36.79 per cent. was officially graded as choice, as compared with 29.81 per cent. for 1953-54.

Restriction of the subsidy to butter sold on the local market plus an amount of export butter equal to 20 per cent. of local sales still continues. The average factory payment to the farmer remained the same as last year—i.e., an interim price of 3s. 10½d. per lb. commercial butter, equivalent to 4s. 8.7d. per lb. butterfat.

A development of note is the contract for the supply by the Queensland Butter Marketing Board of butter concentrate to the British Army and Australian Forces in tropical stations.

One small branch factory closed during the year, leaving 51 butter factories now operating. The great majority of these are in a sound structural condition. The standard of equipment is reasonably good; approximately £197,000 has been spent on new equipment. Four more factories have replaced less intensive pasteurisers with vacreators, and these are obtaining encouraging results. The first of a new type of pasteuriser unit in Queensland was installed during the year and results to date are satisfactory. Two other associations are considering the installation of similar units. Factory managers today are more conscious than ever of the advantages of efficient cream treatment plants, as factories so equipped are effectively demonstrating an improvement in quality. Labour-saving devices such as cream-tipping units, power conveyors and straight-through can-washers have been introduced in the interest of efficiency and economy.

Cheese.

Production of cheese for the year was 7,921 tons. A decline in overseas prices caused a slight diversion of milk from cheese to butter manufacture. Production was 17 per cent. less than the quantity manufactured in 1953-54.

There has been a distinct improvement in the quality of cheese graded this year. The official gradings for first quality were 84.28 per cent. compared with 77.68 per cent. for 1953-54.

Farmers received an average interim price of 4s. 7d. per lb. butterfat during the year. With continued heavy export it seems likely that the cheese position will futher deteriorate.

Five factories ceased during the year, leaving a total of 30 cheese factories operating. Structurally, all buildings are sound and equipment in most factories is satisfactory. A total of £28,800 was spent on equipment and renovations to buildings.

Market Milk.

The consumption of milk has continued to increase not only in Brisbane but in most country centres. New outlets are being sought and one association is investigating the possibility of delivering bottled milk to Longreach, Barcaldine and Blackall.

Production has been maintained at a high level in all districts. About 80 per cent. of Brisbane's milk supply is now drawn from country factories, from which it is transported in stainless steel road tankers. Quality throughout the year was satisfactory except during a few weeks in the summer. The usual compositional troubles were experienced in the spring, but there appears to be some improvement in this respect.

An increasing number of market milk suppliers, in both metropolitan and country districts, have installed refrigerators. These are proving of advantage to the producer and beneficial to quality.

The structural condition of most factories is satisfactory. Plans have been drawn up for the erection of a modern milk factory at a large country centre. One metropolitan factory has received extensive alterations, and foundations for another factory have been completed. Equipment has shown further improvement and continued progress in this direction is envisaged.

It is estimated that approximately 80 per cent. of all eligible children in Queensland are now receiving bottled pasteurised milk daily at school.

The consumption of market milk in Brisbane has increased from 11.2 million gallons per year in 1947-1948 to 16.3 million gallons in 1954-55.

The price paid to producers of market milk in Brisbane remained the same as last year—i.e., 3s. per gallon during the summer price period, equivalent to 7s. 8d. per lb. butterfat at the average fat content of 3.8 per cent., and 3s. 4d. per gallon during the winter price period, equivalent to 8s. 6d. per lb. butterfat. The return to the producer in other centres is generally about equivalent to the Brisbane price.

FIELD ACTIVITIES.

Butter Factories.

Apart from the rigid inspection of equipment and premises and the checking of hygiene, efforts have been concentrated on endeavouring to ensure that butter is manufactured true to grade. Cream grading and all phases of manufacture have been checked with this end in view. Some measure of success has been achieved this year with the aid of more intensive pasteurisation In some factories well-trained personnel have practised the blending of cream skilfully enough to ensure that the manufactured product is true to grade. A high degree of ability in cream grading and cream treatment is essential for this purpose. The weed problem, which is responsible for so much butter being degraded, has not been solved.

Cream carriers in almost all cases have provided good covers for their trucks. Generally, they are co-operating very well and running to time.

Cheese Factories.

Officers carried out regular surveys of factories during the year. There appears to have been a real effort to improve quality and this is reflected in the grading figures. Considerable improvement has been noticeable in those factories which have adopted regular methylene blue testing. Open texture is a defect which has continued to worry factory managers. Departmental recommendations have frequently overcome this trouble, but in other instances it has baffled the most skilled of cheesemakers.

To meet the changing conditions in the cheese industry some thought is now being given to the manufacture of casein, in an endeavour to find an alternative use for portion of the milk supply which would give a better monetary return than that obtainable from butter.

The examination of cheese for extraneous matter by the Commonwealth shows that approximately 90 per cent. of the samples tested are clean to fairly clean.

Most factories are now successfully using single-strain cultures and there have been very few starter failures.

DAIRY PREMISES AND EQUIPMENT.

Hygiene.

Although the desired standard of hygiene has not yet been reached in most districts, there is visible evidence, in the growing use of dual udder-wash containers, strip cups, metal stools, back chains, &c., to

indicate that progress is being made in this direction. The standard of hygiene of the cream supplier is not as high as that of the market milk supplier. In one district where the latter predominates, the percentage of suppliers with a satisfactory standard of hygiene is as high as 90. With a satisfactory price incentive the percentage could be considerably increased in the case of the cream supplier. Faulty rubberware and pulverised manure dust, in addition to many other causes, have had a damaging effect on quality. Officers have beeen instructed to issue orders forbidding the use of unfit or defective rubberware and for the better placement or cementing of cowyards.

Structural Condition.

Since the publication of the new regulations under the Dairy Produce Acts, officers have had to deal with an increasing number of enquiries regarding dairy premises.

Good types of milking sheds on demonstration farms have been inspected by many dairy farmers. Some are desirous of constructing elaborate buildings, but all are unanimous that the combined dairy building, designed by this Division, is the most suitable type. Cement and timber are now more readily available, but corrugated iron is still in short supply. In some districts there is a definite trend towards the all-metal shed.

Most new buildings are being painted and the bails section is often ceiled. Elevated bails, introduced a few years ago, do not seem to be popular; very few have been erected. A total of 536 new premises was erected during the year and 518 were renovated. In some districts much still remains to be done. However, officers are endeavouring to ensure that all premises are of a reasonable standard and have been instructed to set this as an objective to attain as early as practicable.

Hot Water Facilities.

The number of dairy farms still lacking adequate hot water facilities is steadily being reduced. It is considered that within a year or two very few will remain without the requisite facilities. Officers have been assisted by the expansion of rural electrification in certain districts.

Water Supply.

In the past quality has often suffered because of the unavailability at the dairyshed of adequate water supplies for cleansing equipment, a single 1,000 gal. tank being the usual source of supply. A new regulation, introduced during the year, requires at least 2,000 gallons to be provided. The provision of at least this amount will assist in improving quality.

Cooling of Milk and Cream.

Most market milk supply farms are now equipped with coolers; many of these are of the tubular type, but a large number of refrigerators have been installed. This is particularly so in the metropolitan area, but increasing numbers are being installed in country centres. As a result of the use on demonstration farms of tower coolers for milk and charcoal coolers for cream, interest in these types is growing. A tower cooler for cream has been erected at Beaudesert, as a Commonwealth Dairy Industry Extension Grant demonstration project. Should this prove successful, an effective method for the cooling and storage of cream, other than refrigeration, will have been found.

Efficiency of Milking Machines.

A survey conducted during the year revealed a large percentage of milking machines which were not functioning as they should. The main faults were inefficient vacuum pumps, dirty and corroded relief valves, leaks in plant, incorrect pulsator ratio, faulty teatcup assembly, and perished rubberware.

At the Dairy Officers' Refresher Course in May, 20 officers were given instructions in the use of the air-flow meter and vacuum recorder for testing the efficiency of milking machines. It is anticipated that associations will obtain this equipment from the Queensland Dairymen's Organisation, which has offered to supply them free. As these will be available to Divisional officers, it is anticipated that many farmers will receive useful practical assistance in checking the performance of their milking machines.

Cleansing Milking Machines.

The recirculation method, which is claimed to be simpler and more effective than others now in use, was seen in operation for the first time in Australia when a demonstration was held at a Dayboro dairy farm during the year. All officers have been provided with instructions and plans, and in addition the 20 officers attending the Dairy Officers' Refresher Course were given practical instruction in the technique. Arrangements are in hand to determine the most suitable combination of detergents which can be recommended for use with the recirculation method.

An improved method of cleansing milking machines was introduced and recommended by officers during the year. The alkaline and acid cleansers are used alternately to reduce the build-up of milkstones on dairy equipment, especially when hard water is used, the alkaline solution being used on six successive days each week and the acid solution on the seventh day.

Installation of Milking Machines.

A new regulation makes it incumbent on milking machine firms to notify this Department or the local officer of their intention to instal milking machines. The co-operation of firms in this matter has been very gratifying.

FODDER CONSERVATION AND PASTURES.

There is evidence of the dairy farmer's awareness of the necessity to conserve fodder. Officers who have kept this constantly before farmers see a growing interest in this vital matter. Many farmers regard the buckrake as having the best possibilities and interest in its use is widespread. The impression is gained that the present is a most favourable opportunity to foster a fodder conservation drive.

Undoubtedly, pasture improvement is capturing the interest of dairy farmers more than anything else. Demonstration farms featuring improved pastures are receiving much attention and attract many visitors. Pasture Improvement Committees which have been formed are fostering enthusiasm in this development. Officers attending herd recording annual meetings find that a very large number of questions asked are in relation to pastures.

SEASONAL CALVING.

Seasonal calving is a subject which has come into prominence amongst the dairymen of this State, particularly during the past 12 months. The term is given to the practice of calving the whole, or a big percentage, of the herd within a limited period. This period is usually that which is conducive to the greatest production in the ensuing lactation period. Seasonal calving has been featured at the many herd recording annual meetings recently organised by this Division.

The number of questions asked on the subject is another indication of the willingness developing among farmers to apply improved practices where there is reliable information to guide them on the feasibility and economics of the practices. Many farmers are now practising seasonal calving and undoubtedly many more will emulate them.

SURVEY OF DAIRY FARM PRACTICES.

A survey recently completed by this Division deals in a comprehensive manner with the growth and development of dairy farming in Queensland, farm and herd management, milking practices and calf rearing. When published, it should provide much informative material.

REGISTRATION OF DAIRIES.

Officers are completing the registration of dairies in their districts and the Master Register at Head Office is being finalised. A dairy from which milk or cream is supplied for manufacturing purposes will be required to be brought up to a reasonable standard of compliance with the requirements of the Acts within a period of 12 months after registration. A dairy supplying milk for the market milk trade will not be permitted to produce milk unless it complies reasonably closely to the requirements.

EXTENSION WORK.

Steps have been taken to widen the scope of the Division's extension service. It is realised that farm visits, effective though they are, do not permit the field officer to contact the dairy farmer as often as desired. It was considered, therefore, that the method most suitable for effecting an improvement in this respect was to disseminate knowledge amongst groups as well as individuals.

Senior Dairy Advisers were provided with projectors and sets of coloured slides which will be used by them and officers under their supervision for illustrated talks to dairymen. These will be arranged through the Queensland Dairymen's Organisation. Each set of slides will deal with a different extension subject. Although the scheme is in its infancy, a number of talks already given have been much appreciated.

The eight method demonstrations so far held have included recommended techniques for cleansing milking machines (including the new recirculation method), the removal of milkstone, machine-stripping of cows, checking foremilk for mastitis, cooling of dairy produce, cleansing rubberware, and care and operation of milking machines. These short demonstrations show that groups of approximately 20 farmers can be shown a number of processes within a short period of two or three hours. In the normal course of farm visits no more than two farmers would be visited in this time.

A very effective extension method is the organised tour. A most successful one was arranged by the Toowoomba officers of the Division of Dairying, some 450 people attending. Officers of the Divisions of Plant Industry and Animal Industry co-operated very effectively. The tour emphasised the effectiveness of showing a large number of people a variety of recommended practices in the space of a few hours.

Extension work in the form of addresses, meetings, field days and farm visits has been undertaken to enable farmers to derive the maximum benefits from the herd recording scheme. Seventy annual herd recording meetings were held at 56 centres, the average attendance being 34. Agricultural Advisers and Cattle Husbandry Advisers have co-operated at these meetings.

Realising that many young farmers will play an important part in the future activities of the dairying industry, officers have given increasing attention to this organisation. Talks have been given on 38 occasions, films shown, field days attended and advice and assistance freely given.

Field officers, realising the effectiveness of Press and Radio as extension methods, are now making greater use of them. Seven Country Hour talks and 24 radio tapes were prepared.

An attractive wall sheet is being prepared for distribution amongst the 20,000 dairymen of this State. This describes and illustrates recommended milking practices and the care and operation of milking machines.

Eleven articles were prepared for the *Queensland Agricultural Journal* and several for the country Press.

Sixty-six talks were delivered by field officers to Q.D.O. Branches.

During the year arrangements were made for officers in each district to attend a 2-day conference at the headquarters of the Senior Dairy Adviser. All phases of the officers' duties were dealt with; the main purpose, however, was to acquaint officers with the extension methods to be used by them in their future work.

A special exhibit was prepared for the Royal National Exhibition featuring the query "Are you prepared for drought?" It was shown also at several country shows and was the subject of much favourable comment amongst farmers. A smaller exhibit depicting a model dairy shed and layout of yards was also prepared and has been shown at many of the country shows.

All Senior Dairy Advisers have been equipped with cameras. The library at Head Office now contains over 300 coloured transparencies showing improved farm practices on Commonwealth Dairy Industry Extension Grant farms. These have been used at Q.D.O. meetings, discussion groups, annual herd recording meetings, and Junior Farmers' meetings. Extension work of this nature is well received by the farmers. Projectors purchased last year are also located in each Senior Dairy Adviser's district. Black and white prints have been used for reports, journal articles and newspaper stories.

DAIRY OFFICERS' REFRESHER COURSE.

A comprehensive refresher course of three weeks' duration was attended by 25 officers. Lectures, followed by discussions, were given on most phases of field and factory work. Approximately 40 per cent. of the time was devoted to practical work in the chemical and bacteriological laboratories and on milking machines and separators. Five machinery firms generously made their stands and equipment available at the R.N.A. Showground for demonstration purposes. Extension methods were high-lighted when specialist officers lectured on the subject and several Dairy Officers attending the course delivered talks on selected aspects of extension activities.

FARM DEMONSTRATIONS—DAIRY EXTENSION GRANT.

Under the demonstration farm scheme approximately 82 demonstrations were carried on from the first year of the second 5-year period of the Grant. The policy of confining demonstrations on each farm to only one aspect of farm management was adhered to during the year.

During the year 42 new co-operators were selected in the various districts of the State. The selections were made in co-operation with the local branches of the Queensland Dairymen's Organisation. This method of selection caused much more local interest in each project from its initiation. During the year eight farms were sold or the demonstrations terminated by mutual agreement. This left a total of 116 demonstrations at the end of June, but it is anticipated that six of these will also be terminated, leaving 110 farm projects at the commencement of the third year of the present Grant.

The accent in the demonstrations this year has been on improved pastures, both dryland and irrigated. An analysis of the demonstrations at the end of June showed the following projects: improved dryland pastures 77, improved irrigated pastures 24, strip grazing of fodder crops 8, fodder conservation 7, making a total of 116. During the previous year drought conditions immediately after sowing caused the demonstrations in some areas to be either failures or semi-failures. These areas were re-sown or oversown during the autumn.

As pasture improvement is a long-term project, spectacular results are not looked for in the first year. However, the projects constitute demonstrations for neighbouring dairymen on pasture establishment methods, sowing rates and soil conservation practices, and will be used to demonstrate improved management methods and the results which follow a widespread pasture improvement campaign.

During the year 18 field days were held and all were well attended. These days featured the making of silage with the buckrake, soil conservation methods, strip grazing practices, and the establishment and management of improved pastures. Tape recordings were made by six farmers concerning the success of projects on their farms and these were broadcast over local radio stations.

A pleasing feature of the demonstrations is the interest they have created in most areas. Evidence of this is shown in the formation of Pasture Improvement Committees and Discussion Groups in several districts.

The severe floods which followed the cyclones in January and March caused heavy damage to some projects on the rich alluvial flats, but the rain proved very beneficial to others and it is expected that some very good results will accrue during the coming year.

FIELD ACTIVITIES.

A summary of field activities is shown in Table 1.

TABLE 1.

SUMMARY OF FIELD STATISTICS, 1954–55.

Districts.	Farm Visits.	Factory Visits.			Suppliers Tests.	Factory Tests.
		Butter.	Cheese.	Milk.		
Brisbane	3,423	92	15	337	251	8,132
Brisbane (milk quality control)	3,293	72	..	372	356	2,760
Darling Downs (Toowoomba)	3,665	196	137	27	1,984	4,963
Darling Downs (Warwick)	1,983	137	61	90	3,848	6,385
Rockhampton	2,608	181	15	62	901	3,134
Maryborough	2,799	287	20	99	564	3,172
Murgon	2,066	341	39	12	104	3,818
Gympie	2,502	216	24	107	462	1,358
Northern	697	57	..	43	302	2,294
Total	23,036	1,579	311	1,149	6,772	36,016

Table 2 shows farm and factory visits made by officers of the Brisbane Milk Board and Branch field officers to registered Milk Board suppliers and milk factories.

TABLE 2.

BRISBANE MILK BOARD SUPPLIERS AND FACTORY VISITS.

——	Farm Visits.	Factory Visits.	
Milk Board Officers	2,318	1,375	29,777
Divisional Officers	1,703	406	15,231
	3,921	1,781	45,008

ORDERS, CLOSURES AND PROSECUTIONS.

A total of 592 orders was issued. These covered temporary closures of unsatisfactory farms, the erection of new premises or renovation of old ones, the cleansing forthwith of premises where hygiene was poor, and cooling of milk or cream. There was one prosecution, which succeeded.

HERD PRODUCTION RECORDING.

Pure Bred Dairy Cattle.

The commercial dairyman looks to the stud breeders to provide bulls and female stock which will increase the production level of his herd. Therefore, the average production of the purebred herds should be greater than the average production of the commercial herds in the same district. Such averages can only be ascertained if each cow in the purebred herd is tested every year. The rules governing the scheme have therefore been revised to provide for the recording of the whole of the herd. These will come into force on July 1, 1955.

During the year cows from 134 herds were recorded, compared with 145 in 1953-54. The number of cows which completed lactation periods of 273 days or less is given in Table 3.

TABLE 3.

AVERAGE PRODUCTION OF PURE BRED COWS WHICH COMPLETED LACTATIONS, 1948–49 TO 1954–55.

Year.	No. of Cows.	Average Production per Cow.		
		Milk.	Test.	Butterfat.
		Lb.	%	Lb.
1948–49	1,064	6,783	4·8	323
1949–50	1,064	6,608	4·7	310
1950–51	1,153	5,917	4·6	271
1951–52	885	5,571	4·6	259
1952–53	984	6,247	4·6	290
1953–54	1,375	5,860	4·6	271
1954–55	1,359	6,021	4·8	288

The number of cows of each breed which were submitted for recording are shown in Table 4, together with the number and percentages which passed or failed to reach the age-production standards and the number withdrawn.

TABLE 4.

RESULT OF PUREBRED COWS RECORDED, ACCORDING TO BREED.

Breed.		Total.	Passed.	Failed.	Withdrawn.
A.I.S.	No.	520	266	199	55
	%	..	51·1	38·3	10·6
Ayrshire	No.	35	28	6	1
	%	..	80·0	17·1	2·9
Friesian	No.	2	..	2	..
	%	..	..	100·0	..
Guernsey	No.	85	48	28	9
	%	..	56·5	32·9	10·6
Jersey	No.	872	439	343	90
	%	..	50·3	39·3	10·3
Total	No.	1,514	781	578	155
	%	..	51·6	38·2	10·2

Table 5 shows the average production, according to breed, of cows which completed lactation periods of 273 days or less.

TABLE 5.

AVERAGE PRODUCTION OF PUREBRED COWS, ACCORDING TO BREED.

Breed.	No. of Cows.	Average Production.		
		Milk	Test.	Butterfat.
		Lb.	%	Lb.
A.I.S.	462	7,308	4·1	297
Ayrshire	34	7,474	4·6	343
Friesian	2	5,352	3·4	184
Guernsey	76	5,941	4·9	291
Jersey	785	5,209	5·4	281

The fifth annual report on pure bred production recording was published. The publication included the third supplementary list of cows which had qualified for entry into the Registers of Merit. This report is widely used by stud breeders and commercial dairymen as a guide to the selection of breeding animals.

The Registers of Merit were introduced to give prominence to animals which have produced at a consistently high level over a number of years.

The total number of cows which have now qualified in each section are—Elite section 5, Lifetime section 26, and Intermediate section 136.

GROUP HERD RECORDING SCHEME.

During the year 10 new herd recording groups were formed, bringing the total number to 65. The continued interest in herd recording is indicated by requests for the formation of a further 10 groups during the ensuing year.

For the group herd recording year ended September 30, 1954, a total of 41,378 cows from 1,202 herds completed lactation periods. The average production of these cows was 134 lb. butterfat, a decrease of 16 lb. compared with the previous year. This decline was mainly caused by the very dry conditions experienced from March to July, 1954. The effect of this dry period on production stresses the need for the storage of adequate supplies of fodder.

It has been found that members of herd recording groups are showing an ever-increasing interest in many aspects of farm management, including establishment of improved or irrigated pastures, renovation and top-dressing of existing pastures, strip grazing, subdivision, conservation of surplus pasture, and herd management and breeding.

Commencing with this recording year, the official lactation period was extended from 270 to 300 days in order to obtain uniformity with all the other Australian States. This extended period allows greater prominence to be given to those animals which milk for a 10-months' period.

Recording figures for the year show the average length of lactation to be 210 days. This short lactation is one of the reasons for the low average production per cow in Queensland. This is clearly shown in Table 6.

TABLE 6.

NUMBER, PERCENTAGES AND AVERAGE PRODUCTION OF COWS ACCORDING TO LACTATION PERIOD.

Length of Lactation (Days).	No. of Cows.	Percentage of Cows.	Average Production.		
			Milk.	Test.	Butterfat
			Lb.	%	Lb.
300 ..	5,461	13·2	4,576	4·4	199
270 ..	6,257	15·1	4,097	4·3	177
240 ..	8,137	19·7	3,625	4·3	155
210 ..	6,881	16·6	3,166	4·2	134
180 ..	5,134	12·4	2,622	4·2	110
150 ..	3,559	8·6	2,122	4·2	89
120 ..	2,512	6·1	1,633	4·2	68
90 ..	1,659	4·0	1,174	4·1	49
60 ..	1,139	2·8	743	4·2	31
30 ..	639	1·5	369	4·3	16

It will be noted that only 13.2 per cent. of the cows milked for 10 months, whilst 23.0 per cent. milked for less than 6 months. Cows which milked for 300 days averaged 199 lb. butterfat, or 65 lb. more than those which milked for only 210 days. This difference of 65 lb. butterfat is worth £15 16s. at current values. As there are approximately 915,000 dairy cows in this State, the economic loss due to short lactations is a serious one.

The main cause of short lactations is a low standard of nutrition. The remedy is the conservation of greater amounts of fodder, to be used as soon as the nutritive value of the grass decreases and to provide adequate provision against dry periods.

Sire Surveying.—The surveying of sires used in herds recorded under the group herd recording scheme was commenced during the year. The issuing of these surveys enables farmers to assess the value of the herd sire and will eventually indicate the most reliable strains to use. Members of herd recording groups have expressed appreciation of this service.

Calf Identification.—During the year a free heifer calf identification scheme was introduced for members of herd recording groups. This will allow farmers to keep reliable herd records which will be very useful when planning breeding programmes and for sire surveying.

Surveys.—Surveys have been continued, the information being obtained from members of the herd recording groups. The results have been subsequently used in herd recording extension work.

These surveys include:—

(*a*) *The effect of the month of calving on production.*—This survey, which covered the period from 1948 to 1954, showed that in most districts there is a distinct advantage to be gained by calving cows in the third quarter of the year.

(*b*) *The effect of length of lactation on production.*—The results have been shown in Table 5.

(*c*) *Production according to butterfat test.*—This survey, which is continuing, shows that within breeds there is a strong correlation between butterfat test and the yield of butterfat.

(*d*) *Comparison of production as shown by herd recording and factory returns.*—A survey of results from 508 farms showed that the amount of produce supplied to the factories was 91.7 per cent. of the recorded production. The figure for the previous year was 93.3 per cent. These results compare very closely with those of a similar survey conducted in New Zealand during the year 1953-54, which gave a result of 92.8 per cent.

(*e*) *Survey of milking times and practices.*—This survey, compiled from data collected from 1,070 farms, dealt with hand-milked and machine-milked herds, makes and sizes of machines, milking rates, and other aspects.

DAIRY RESEARCH BRANCH.

Mr. L. E. Nichols, Director of Research.

The activities of the Dairy Research Branch have covered a wide field of investigations and considerable technical assistance has been given to all sections of the dairy industry.

Through the laboratories at Brisbane, Toowoomba, Murgon and Malanda, the service has included investigation of chemical, bacteriological, and manufacturing problems of dairy produce, in addition to routine laboratory quality control schemes. As indicated by the marked increase in the number of samples examined in the country laboratories, it is evident that both farmers and factories are making good use of the decentralised technical services.

A feature of the year's work has been the increased number of investigations to assist the cheese industry. These have been designed with a view to effecting economies in cheesemaking methods and improving the presentation of cheese to help increase local consumption. Some of this work has resulted from observations made by officers in overseas countries and Victoria.

Good progress has been made with the establishment of the butter laboratory within the Butter Marketing Board's new premises at Hamilton. It is anticipated that the transfer from the present laboratory to the new one will take place towards the end of 1955. The facilities provided will allow of more extensive research into problems of the butter industry.

Following attendance of the Director of Research at the World's Dairy Congress in 1953, 25 illustrated talks on overseas dairying practices were given throughout the State. A number of practices observed in other countries are being tried and encouragement given to their wider application.

INVESTIGATIONS.

Most investigations have been designed to aid improvement in quality, utilisation and presentation of dairy products.

Milk.

Reconstituted Milk Trials.—It is believed that reconstituted milk may point the way to the more effective utilisation of skim-milk powder and butteroil in countries where at present there is an acute shortage of milk protein. The requisite basic materials could be produced in Queensland.

Last year's trials revealed the practicability of producing a palatable product from Queensland butteroil and skim-milk powder. As the quality of the butteroil and skim-milk powder chiefly determines the flavour of the reconstituted milk, chemical and bacteriological analyses were made with a view to ascertaining the requirements which must be fulfilled to ensure that a reconstituted milk of the desired quality is produced.

In trials using choice vacreator-treated cream, fresh cream and unsalted butter as alternative sources of fat, results were obtained which indicated that the final product was comparable in quality with that made from butteroil and skim-milk powder. It was also shown that butteroil could be used with satisfactory results after two months in cold storage. Better results have been derived from the use for reconstitution of low-temperature pre-heat spray-dried skim-milk powder, dissolved in water overnight prior to incorporating the butteroil, than by simultaneous mixing of all ingredients.

With a view to improving flavour, tests have been made on the inclusion of 10 per cent. buttermilk powder, ascorbic acid, calcium lactate and sodium chloride in the reconstituted milk. In each case, quite palatable milks were obtained, but the results to date show no distinct advantage for any additive over milk reconstituted from skim-milk powder and butteroil. It would appear practicable to produce reconstituted milk, even in small quantities, at a cost which does not exceed that of normal milk.

Utilisation of Milk Byproducts in Breadmaking.—Previous work has shown that the inclusion of milk byproducts in breadmaking can give a product of improved texture and keeping quality. A number of experimental batches of milk bread were made, using both skim-milk and buttermilk powder, for the purpose of ascertaining the proportions which would produce a suitable milk-loaf. The addition of 4 per cent. of these powders in the dough has given satisfactory results. However, 2 per cent. of high-heat buttermilk powder incorporated in bread dough will produce bread having an attractive crust, colour, flavour and soft crumb and good keeping quality, without an appreciable increase in cost. A slightly increased number of loaves, due to increase in loaf volume, has also resulted. The higher fat content in buttermilk powder appears to improve the flavour of the bread and its use is preferred by some bakers.

Seasonal Variation in the Composition of Milk.—Wide seasonal variation in the composition of milk constitutes one of the problems of the dairying industry, preventing compliance at times with legal standards of composition for the market milk trade and necessitating modifications in cheesemaking procedures to avoid manufacturing faults.

Although the problem is of world-wide significance, the period of decline in composition varies in different countries, but seemingly is related to the decline in the nutritive value of the pastures. The period of maximum decline in milk composition in Queensland has been shown to be during the dry late winter and early spring months. It has been established by overseas workers that, contrary to past beliefs, under certain conditions feed does bring about changes in the fat and the solids-not-fat percentage of milk.

Trials on two farms this year again showed the effect on the fat content of milk of feeding selected rations to cows during the late winter and early spring months. On one farm, locally produced long bush hay was fed to one group of cows at the rate of 7 lb. per cow per day, in addition to normal feeding. A definite improvement in the fat percentage of the morning milk resulted, the mean value being 0.3 per cent. higher for the experimentally fed group of cows than for the normally fed control group. Total daily fat production was also increased, whereas little change was recorded in overall milk production. Encouraging results were obtained on another farm, where a mixed mineral supplement in addition to normal rations was fed. However, further confirmatory work in this trial is necessary. Although improvement in the fat percentage of milk was effected as a result of the feeding practices on both farms, little change was recorded in the solids-not-fat percentage, and further modifications are proposed using long roughage, mineral supplement and freshly cut lucerne.

Cheese.

Cheese-Yield Investigations.—Concern has been expressed by a number of cheese associations at the marked differences in cheese yield throughout the year. The variation is sufficiently wide to affect both the economy of factory operations and the pays made to suppliers.

The accurate sampling of bulk cheese milk has been regarded as fundamental to the major work in connection with cheese yields, and so a line sampler has been designed and constructed in order to facilitate the work. Studies on cheese yields using this apparatus have now been extended to include the following factors:—

(1) Seasonal influence on milk quality.
(2) Influence of animal feeding on cheese-milk quality.
  (*a*) Natural pasture (Category 1).
  (*b*) Crop feeding (Category 2).
(3) Role of milk components in the cheese-yielding capacity of milk.

Milk, cheese and whey are analysed at 4-weekly periods and cheese manufacture standardised as far as possible. The actual yields of cheese are obtained by weighing and the theoretical yields by computation. So far, marked differences in milk composition and yields of cheese from the milks have been noted. The results indicate that great differences in solids-not-fat and in casein are accompanied by only small differences in the fat content, and fairly close correlations appear to exist between the casein and solids-not-fat percentages and the yield of cheese. This encourages the belief that it should be possible to develop a cheese test table based on solids-not-fat and fat to serve as a guide to cheesemakers.

Because of the difference between categories, comparisons were made of the fat and casein contents of the milks for February, March and April this year. Good relief rains fell at the end of February and the end of March with immediate effects on pasturage. The results are as follows:—

	Fat	Casein.
Category 2—February ..	3.8 ..	2.18
March	3.8 ..	2.43
April	3.8 ..	2.41
Category 1—February ..	3.9 ..	2.30
March	4.0 ..	2.57
April	4.1 ..	2.54

Little effect was observed in the fat content of the milk, but an appreciable effect of the casein content was recorded. The improved natural pastures increased the casein content of the milk, with a consequent increase in cheese yield.

Cheese Packaging Trials.—It is generally agreed that the matter of improved cheese packaging is important in stimulating sales of cheese. Consequently, trials with improved covering agents have been commenced. Plate 7 (See Director of Dairying's report) shows the effect of the improved packaging with an imported polythene plastic covering applied under vacuum. Initial trials of the process were conducted using a small number of cheese, but the results were so satisfactory that two trials on a full commercial scale were then held. Not only has mould and cheese mite infestation been prevented but a considerable saving in shrinkage loss has been attained. The following table illustrates the results obtained.

Percentage Shrinkage—

Age of Cheese	Plastic Covered Cheese.	Waxed Cheese.	Unwaxed Cheese.
6 weeks ..	0 ..	1.0 ..	4.0
12 weeks ..	0 ..	1.7 ..	6.0

For bulk cheese, the plastic bags offer advantages. The bags allow the production of a rindless cheese without the use of cheese-cloth and caps. The process is considered economical because of the saving in shrinkage and materials. Two other covering materials, a plastic and a rubber derivative, are also being tested using specially designed rectangular cheese moulds, a cutting machine and pressure boxes. This technique may prove advantageous in the retailing of cheese.

Short Process Cheddar Cheesemaking.—With the object of reducing manufacturing costs in cheddar cheesemaking, trials with short cheesemaking methods have been continued. A total of 15 vats of cheese was manufactured. The process originated in America, and incorporated the principle of using a heat resistant starter, *Streptococcus durans*. The process was modified by the C.S.I.R.O. and has been employed with and without further modifications in experiments under Queensland conditions. Cheese with cheddar characteristics was produced with a reduction in manufacturing time of 1½ hours, but the quality was variable, with texture faults and delayed flavour development. It was also found that the pH of the cheese produced by the short process was commonly higher than that of normal cheddar; this factor is under further investigation.

Some improvement in flavour and texture was attained by employing the short process in the manufacture of a stirred curd variety of cheese. Higher acidities were used in the manufacture of the stirred curd variety than in the normal short process, and on the average the former graded 1 point higher than the latter.

It would seem much more investigation of the short process has to be carried out before it can be accepted with as much confidence as is placed in the orthodox process.

Cooling Milk in Relation to Cheese Quality.—The value of farm cooling of milk for cheesemaking has been demonstrated in further trials of the tower water-cooling system. A further eight vats of cheese have been made from milk so treated. The methylene blue and acidity tests of the milk showed that the mixed cool milk had a lower acidity and gave a longer reduction time than the mixed uncooled milks.

The results show a significant difference between the grades of the trial and control cheese, varying from a minimum of a half-grade point at 2-3 weeks of age to a maximum of 3 grade points at 6 months in favour of the trial cheese. There was a tendency for a wider grade points margin during the summer months than during the winter months, thus emphasising the importance of cooling milk during the warmer months of the year. The benefits of cooling also became more evident as the cheese matured.

Butter.

Escherichia coli in Butter.—Following complaints that some butter exported did not conform with the standards of the importing country because of the presence of *Escherichia coli*, efforts were made to determine the incidence of this type of organism, source of origin and control measures.

It has been shown that *E. coli*, although present in most factories, occurs only in very small numbers. Efforts to eliminate sources of contamination have met with some success. Existing cream pasteurisation practices readily destroy the coliform bacteria, but recontamination occurs from cream-holding vats and churns, the glands being largely responsible. More intensive heat sterilization, chemical sterilization with hypochlorites and the repacking of glands can give a measure of control. At a further safeguard, it is advisable to sterilize the packing used.

Higher salt concentrations in butter may prevent the development of *E. coli*, and the effect of various salt concentrations is being examined.

Intensity of Cream Treatment.—With the object of assisting improvement in the overall percentage of choice grade butter manufactured, trials have been designed in an endeavour to assess the value of more intensive systems of cream pasteurisation. Previous work has emphasised the value of double-pasteurisation for the improvement of cream and butter quality.

Work continued this year has indicated the value of intensive processing and the efficiency of use of steam applied in the removal of off-flavours from cream. The use of concurrent flow of steam in tandem and triple unit pasteurisers with reduced rates of cream flow has effectively renovated cream with highly variable initial acidities up to .0.4 per cent. lactic acid. The effect on the keeping quality of the butter, fat losses in manufacture and bacteriological quality, however, are still under examination.

The more intensive systems of processing appear to reduce the size of the fat globules and thus a higher loss in buttermilk is possible. This aspect is receiving further attention in the course of investigations on the economy of processing.

New Cream Treatment Unit Trials.—Investigations have commenced into the operation of a new type of cream treatment unit. The unit incorporates the advantages of preheat treatment of cream, counter-current steam flow, and in-place chemical cleaning.

Encouraging results have been obtained in eight series of examinations so far made. Butter flavour, texture, chemical composition and bacteriological quality have been satisfactory. The keeping quality of the butter after 1, 2 and 6 months' storage, as well as the economics of processing, are also being examined. A strict check on the initial quality of the cream is being maintained and choice grade only used in the trials. An attempt is also being made to gauge the ability of the machine to treat cream of widely variable quality. The unit is cleaned by an in-place method and a number of modifications in the technique are being tried to increase its efficiency.

The trials with this equipment will continue until the end of next summer, when all the results obtained will be reviewed.

pH of Butter in Relation to Keeping Quality.—This project, which is being carried out in conjunction with the Queensland Agricultural High School and College, is designed to determine the optimum pH for good keeping quality in butter. The elimination of variables other than pH has been successfully arranged under the experimental conditions.

Twenty-three groups of churnings have been made at three pH ranges and of these 15 have been examined after 6 months' cold storage and the remaining 8 after 4 weeks' storage. To obtain the desired ranges of pH, caustic soda was used for the final pH adjustments. When 26 groups of churnings have been completed the system will be extended to a commercial factory using normal neutralising compounds.

The results so far suggest that alkaline butters with a pH approaching 8.0 have superior keeping quality to those with pH ranging from 6.8 to 7.5. Average grade points differences of 2 have been recorded. However, other factors have yet to be examined: namely, the effect of the higher pH on butterfat losses and its effect on the quality of buttermilk powder.

LABORATORY CONTROL SERVICES.

Market Milk.

There is a direct relationship between the quality of raw milk and the keeping quality of the pasteurised product. Raw milk has therefore been subject to critical examinations in order to determine its suitability for pasteurisation.

Raw milks from local suppliers and bulk milks from country depots have been tested regularly at receiving depots. Microscopic examinations of low quality raw milk, as well as the regular bacteriological and chemical examinations of samples of bottled pasteurised milk, have been continued in the Branch laboratories.

A total of 347,245 methylene blue and butterfat tests was made at factories, and 25,514 examinations were made in the laboratories. Table 1 summarises the results obtained in comparision with the previous year.

Table 1.

Summary of Milk Examinations.

	1953–54.	1954–55.
Plate counts—bottles pasteurised milk ..	1,782	1,698
Presumptive coliform tests	2,790	2,863
Phosphatase tests—		
Number	1,564	1,567
Percentage negative	98·4	99·7
Pasteurised milk fat tests—		
Number	1,702	1,654
Average percentage	3·91	3·86
Microscopic examinations	8,333	7,342
Raw milks at Depots—		
Methylene blue tests—		
Number	227,845	263,627
Percentage below 4 hours	6·1	6·2
Fat tests—		
Number	79,031	83,618
Percentage below 3·3%	4·9	2·6
Bulk milks from country depots—		
Methylene blue tests	5,825	6,725
Fat tests	5,639	3,665
Factory surveys	80	64

Raw Milk Quality.—As shown by the small percentage of raw milks with a methylene blue test below 4 hours the quality of raw milk has been well maintained. The widespread acceptance of this test by market milk associations and the increased number of tests performed have helped to maintain quality standards.

Smears of low quality milks have been forwarded to the laboratory for microscopic examination, and reports of the tests giving probable causes of the low quality and advice on remedial action have been sent to producers. In some cases, where suppliers have experienced difficulty in locating causes of poor quality, farm surveys using rinse techniques have helped to locate faults. High counts of thermoduric bacteria have been recorded in some milk supplies. The presence of these bacteria is an indication of contamination from milkstone on dairy equipment. They are readily detected by plate counts of laboratory-pasteurised milk and where they exceed 50,000 per ml. contamination is considered excessive. Regular examinations for fat, solids-not-fat, and freezing point have shown that generally there has been good conformity with legal standards. The percentage of suppliers who forwarded milk failing to reach the minimum standard of 3.3 per cent. fat was lower than in the preceding year. Both low fat and low solids-not-fat percentages have been recorded in some supplies. The adoption of more uniform milking intervals and better feeding has helped to improve the fat percentage on some farms.

Of 480 milks subjected to the freezing-point test for added water, only 6 (1.2 per cent.) showed evidence of adulteration. Some suppliers have questioned whether low solids-not-fat percentages always indicate adulteration. If no water is added, the freezing-point shows little variation even with wide fluctuations in the solids-not-fat percentages. The inclusion of cows yielding milk with a higher solids-not-fat content, coupled with good feeding practices, is recommended to avoid wide changes in the chemical quality of milk.

Farm Refrigeration.—A survey of the efficiency of farm refrigerators for the cooling and storage of market milk has shown that, provided a good standard of dairy hygiene was maintained, milk came out of overnight refrigerated storage with the same keeping quality as when it went in. If the milk temperature was below 50°F., keeping quality was extended 24 to 36 hours. Refrigerated storage made once a day collection of milk possible, and the inclusion of the refrigerated evening's milk supply ensured milk of more uniform composition.

Tanker Milk.—Monthly testing in the laboratory of samples from tankers was introduced. Some 350 samples were examined by methylene blue reduction, fat, milk solids and freezing point tests.

Raw Milk Vendors.—During the year the regular sampling and testing of milk from raw milk vendors was started; 650 samples were tested for methylene blue reduction time and fat and examined microscopically at reduction of the methylene blue or after 5 hours. The results of these tests and an indication of the probable cause of low quality are sent to the producers. The keeping quality test has proved useful in detecting faults in the production of such milk. Only 10 per cent. of the samples examined had methylene blue tests below 4 hours, and 4 per cent. were below the 3.3 per cent. minimum standard for fat.

Pasteurised Milk Quality.—The very high percentage of negative phosphatase tests (99.7 per cent.) recorded reveals that a high standard of pasteurising efficiency was achieved.

Samples of bottled pasteurised milk collected regularly from processing depots were examined for total bacterial count, keeping quality and coliform organisms. Chemical tests included phosphates, butterfat, solids-not-fat, and freezing point. The plate count, because of its variability and sensitivity to temperature of incubation and media, has been discarded as a key test for pasteurised milk quality and is being used more as an advisory test in line-run surveys and for detecting the incidence of heat-tolerant bacteria following pasteurisation. The percentage of pasteurised milk samples that complied with a keeping quality standard of ½ hour by the methylene blue tests applied after 18 hours' incubation at 18-20°C. was 97. The results indicate a good keeping quality for pasteurised milk.

The presumptive coliform tests has proved most reliable as an index of post-pasteurisation contamination. The provisional standard of a negative test in 1 ml. samples has presented a problem for some factories, but the majority have now shown that this standard is capable of achievement and consistently satisfactory results are being obtained with benefit to milk quality. Of the samples tested, 12.2 per cent. had coliforms present in 1 ml.

The compositional quality of pasteurised milk has been well maintained.

To check the efficiency of bottle washing, a provisional laboratory standard of not more than 200 colonies per bottle has been adopted. The majority of factories can now attain this standard, thus indicating an improvement in the efficiency of bottle washing.

During the year, 64 surveys were made of milk pasteurising plants to check their efficiency and to locate possible sources of contamination.

Testing of Samples for the Commonwealth Government.—The testing of samples for the Commonwealth Immigration Department and Defence Forces was continued, and 104 samples of pasteurised milk were examined. Generally, the samples complied with the high standard of quality demanded of this milk.

School-milk.—The results of samples regularly tested indicate a good standard of quality.

Rapid Phosphatase Test.—The possible advantages of a more rapid phosphatase test than that at present used suggested that comparisons be made between the official Kay-Graham test (K-G) and the Aschaffenburg-Mullen method (A-M). The results so far obtained have indicated that the A-M test using 2 hours' incubation is at least as sensitive as the K-G test using 24 hours' incubation. The A-M test is simple to carry out, and being highly specific is unlikely to be affected by interfering substances. This test seems to offer several advantages over the official K-G test and should prove of value in the routine control of milk processing.

Butter Improvement Service.

Chemical.—Determinations on 1,678 samples at the Hamilton laboratory showed the average composition of butter to be:—moisture 15.57 per cent., salt 1.29 per cent., fat 82.29 per cent., curd 0.85 per cent. These results indicate that Queensland butter conforms to a good general standard of composition and that a worthwhile effort has been made by most factories to manufacture butter most economically. Only 17 samples (approx. 1 per cent.) were found to be overmoisture. The mean of 891 pH determinations was 7.68, approximately the same as that of last year. The trend in recent years to a more alkaline butter is considered desirable because of the beneficial effect on keeping quality. It is also pleasing to record that the number of butters of pH less than 6.8 is now almost negligible.

Bacteriological.—A total of 1,678 samples of butter was examined bacteriologically. The bacteriological quality index was 247, compared with 230 in the previous year. The results indicate that a fairly good standard of hygiene is adopted by most factories. There is, however, a conspicuous seasonal effect on the bacteriological quality index, the decline being most marked during the warmer months of October to March.

Microscopic Examinations.—Microscopic examinations are carried out to determine the distribution of moisture droplets in the butter as a check on the efficiency of working in manufacture. Of 1,678 samples examined, 81 per cent. were classified as "well worked" or "fairly well worked". This shows a good general standard of working during manufacture.

Good correlation has been shown between the droplet count, bacterial development and texture defects. By thoroughly working the butter, thus producing a large number of small droplets, bacterial development is restricted and texture defects in butter are reduced. The microscopic examination is thus considered a valuable aid in assisting the overall improvement in quality of Queensland butter.

Extraneous Matter in Butter.—Much importance is now being placed by overseas marketing authorities on the presence of extraneous matter in dairy produce. A survey of the extraneous matter in butter from most Queensland factories was completed and showed a good standard generally.

Butterfat Losses.—Butterfat estimations in liquid buttermilk and buttermilk powder have been regularly determined to help factories effect further economies in butter manufacture. Irrespective of the intensity of cream processing and the type of pasteuriser used, variations in butterfat losses occur, ranging from 1.1 per cent. to 1.5 per cent. Fat percentages in buttermilk powder have varied from 12 per cent. to as high as 15 per cent. Where fat losses exceed 12 per cent., a check on the efficiency of factory processing is made.

The fat lost in buttermilk has shown a close relationship to the degree of dilution of cream during processing and already a number of factories are giving consideration to the provision of preheating devices for cream to minimise dilution and effect economy in steam usage.

Churn Barrel Preservation.—Investigations have been continued in conjunction with the Forestry Sub-Department with a view to preventing the rapid deterioration of some churn barrels made from Queensland timber. Three trials were commenced using two different types of commercial fungicides—zinc naphthenate and a sodium salicylanilide salt. An imported plastic preparation is also being tried out under laboratory conditions before trial in a commercial factory.

Keeping Quality Competition.—The keeping quality competition was continued with the co-operation of the Dairy Factory Managers' Institute. The competition has proved helpful and already a number of factors are emerging which bear some relationship to the keeping quality of butter.

Field Work and Advisory Services.—Fifty-two surveys of butter factories were conducted by laboratory officers in association with officers of the Field Branch. These surveys were aimed at overcoming specific problems such as manufacturing difficulties, quality defects, and bacterial contamination.

Cheese Improvement Service.

This Branch has continued to provide cheese starter cultures to all cheese factories in the State, and a total of 649 cultures was distributed. The number forwarded in recent years has shown a progressive decrease. This trend is regarded as a significant indication of an improvement in factory starter control methods. Very few factories have experienced starter failures and the stage has been reached where most factories are successfully using single-strain cultures.

Freeze-dried Starter Cultures.—In conjunction with the C.S.I.R.O., some cultures have been distributed in the freeze-dried form. The method is being tried to overcome some of the disadvantages of time and distance in the distribution of cultures in liquid media, and to facilitate the storage of cultures in laboratories and factories. Generally the cultures have been found satisfactory despite storage periods up to six months, and they compared favourably with cultures distributed in chalk-litmus milk. However, the method of subculturing under factory conditions is open to some criticism and it is hoped that a simple and more satisfactory method can be developed.

Phage Cross-relationship.—Work on the cross-relation ship typing of phages against starter strains is proving of much value in advising suitable rotations of starter cultures for factory use. Recent work has confirmed that there are no more than eight separate and distinct strains of *Streptococcus cremoris* in cultures at present available in Queensland.

Influence of Milk Composition on Starter Growth.—Trials have been commenced to show if the composition of cheese milk has any influence on starter growth. It is still too early to draw any definite conclusions, but it is evident that milks vary greatly in their ability to support starter growth.

Penicillin and Cheese Starters.—In view of the wide use of penicillin as a preventive against mastitis, all single-strain starter cultures available have been tested for sensitivity to penicillin. All strains except *Streptococcus durans* were markedly susceptible to concentrations of penicillin in excess of 0.2 units per ml. (*Streptococcus durans* showed normal growth in concentrations exceeding 1.0 units per ml.) Some strains of *S. cremoris* and *S. lactis* were affected by concentrations as low as 0.1 unit per ml. Suppliers of cheese milk should reject milk from cows treated with penicillin for at least two milkings after treatment, because of the susceptibility of cheese starters to penicillin.

Gassy Cheese.—Two outbreaks of gassy cheese have been investigated during the year. As shown last year the trouble was due to coliform bacteria in the cooling water supply which gained access to the pasteurised milk through the leaking pasteurisers.

Cheese Sediment Testing.—Following the introduction of sediment testing of cheese by the Government Analyst, it is pleasing to note that of 15 tests so far conducted, only two were considered unsatisfactory. Follow-up by officers of the Branch showed one of the causes to be dusty cheese salt. The satisfactory state of the cheese in regard to its extraneous matter content indicates that clean methods of manufacture are being used by most cheese factories.

Fly Control.—Four new insecticides were tried out for the control of flies at cheese factories and on cheese-milk producing farms. Of two insecticides tried under factory conditions, one gave much better results than the other when both insecticides were applied to the waste water pits, drains and absorption areas. Two other imported insecticides tried on farms reduced the fly population temporarily, but the method of application on the floors of the milking sheds is not conducive to any lasting effect.

Control of Mould in Cheese-Curing Rooms.—The experimental work using quartz glass ultra-violet lamps to control mould on cheese held in curing rooms was completed. The experiment was very successful and as a result of the trial the method has been adopted by one large cheese association.

Branding of Semi-Mature and Mature Cheese.—At the request of the Prices Branch, investigations have been conducted to determine a suitable means of giving semi-mature and mature cheese a distinctive branding, so that consumers may readily distinguish their preferences. It was found that the rind of such cheese could be coloured with either Carmoisine Red or Brilliant Blue in a 50-per cent. alcohol solution. Such dyes are included in the lastest list of approved foodstuff dyes and have been used in branding trials.

Non-Cheddar Varieties of Cheese.—As the development of new cheese types may help to increase cheese consumption, associations have been given advice on the manufacture of cheese other than cheddar. These have included cottage cheese, Fetta cheese and smoke-flavoured cheese. Several batches of homogenised cheese and stirred curd cheese have also been made.

Field Surveys.—Thirty-four visits were made to cheese factories for the purpose of conducting surveys and giving advice on various matters.

MILK AND CREAM QUALITY IMPROVEMENT DEMONSTRATIONS.

From funds provided by the Commonwealth Dairy Industry Extension Grant, techniques are being demonstrated to assist the improvement of milk and cream quality. Farm surveys have shown that the majority of milk and cream quality defects are due to contamination from dairy equipment and lack of adequate cooling on the farm.

Improved Dairy Detergents.

Eight methods of cleaning dairy farm equipment have been demonstrated on 26 farms. The value of each method has been assessed by visual inspection and bacteriological examination of rinses and swabs of milking equipment.

The alkali-citric acid method, which was originally developed in New Zealand, has given satisfactory results in all districts and has proved popular with farmers. The use of the method is extending rapidly. The technique was designed for the purpose of preventing build-up of milkstone on dairy equipment and involves the use of mixed alkalis with wetting agent for six days a week and citric acid with wetting agent on the seventh day.

An alternative and cheaper method which is also being tried is giving satisfactory results. The cleanser consists of a less expensive soda ash-wetting agent as the alkali mixture and phosphoric acid and wetting agent as the acid mixture.

Wetting agents, which have been tried in most dairy detergents and chemical sterilants, have increased the efficiency of each of the methods demonstrated, especially on farms which have hard waters.

In all methods used so far, the results indicate that the technique practised for cleaning equipment and the quality of the water used are as important as the chemical composition of the cleaning compound.

Recirculation Cleaning of Milking Machines.

Bacteriological examination of rinses of dairy equipment have shown that the milking machine constitutes the most important source of contamination causing defects in milk and cream. As an aid to the more efficient in-place cleaning and sterilizing of milking machines, recirculation techniques have been tried using the alkali-acid method. The method allows best use to be made of limited water supplies, and because of the longer contact time with both detergents and chemical sterilants, a more effective treatment is possible. Milkstone deposits in milking machines were softened by the method, but difficulty was experienced in rinsing the softened deposit from the machine without brushing.

Dairy Rubberware.

In view of the rapid deterioration of dairy rubberware, a survey of milking machine inflations was made to determine the importance of absorbed fat as a possible cause. Of the used inflations examined, 78 per cent. have shown undue amounts of absorbed fat, in some cases reaching as high as 20 per cent. of their initial weight. The degree of fat absorption varied with different types of rubber used. Fat absorption was highest in reclaimed rubber or where only natural rubber was used. Stretching and cracking increased with absorption of fat, and milking efficiency became impaired. Under normal farm conditions, synthetic rubber inflations showed least fat absorption and a minimum contamination. They also gave a longer working life with a well maintained efficiency in milking.

Cooling Milk and Cream.

An effective system of cooling milk and cream on the farm is necessary if quality is to be maintained following cleanly methods of production. Efforts have therefore been made to develop a cheap yet efficient system for cooling and cool storage of milk and cream on the farm.

Milk Cooling.—The value of cooling milk has been demonstrated on 17 selected farms. In general, the results have shown that a very appreciable degree of milk cooling can be achieved using the tower recirculated water system. Under proper conditions a milk temperature 20°F. to 25°F. lower than otherwise attainable has resulted, the reduction being consistently to within 5°F. of the existing wet bulb temperature. For maximum efficiency a water-milk ratio for cooling of not less than 6:1 is essential.

Cream Cooling.—To offset the increasing costs of installing recommended systems for cooling cream on farms, consideration was given last year to certain modifications to the water-tower cooling method that would achieve this end without impairing actual cooling efficiency.

Two trials were arranged along the following lines:—

(1) The use of a charcoal cooler unit for both cooling and holding the cream, thus considerably decreasing installation costs by avoiding the use of a tower water cooling system.

(2) The use of a smaller tower water-cooling system for cooling the cream, followed by storage of the cans in an extension of the water pit. Both the units have been designed and built and are now ready for demonstration purposes over the next 12 months.

ANALYTICAL.

A total of 53 factory water supplies has been analysed during the year and water treatments have been designed for several associations. The treatment applied by one association has considerably reduced corrosion of equipment and halved the amount of detergents used. Together with the economies effected in boiler treatment, the

saving to the association concerned has been estimated at approximately £1,000 per annum. A paper on the method is now in the course of preparation for publication.

A total of 2,028 samples was submitted for general analysis. The samples included butter, milk, cheese, water, margarine, brines, detergents and waste waters. The considerable increase in the number of analyses was mainly in connection with current investigations. With the drying of separated milk and buttermilk now being more widely practised, numerous samples of these powdered products have been received for analysis to aid uniformity of quality and composition.

Chromatographic methods are being applied in an attempt to isolate and define the chemical principles responsible for flavour of dairy products. Those receiving attention include the various amino-acids and other breakdown products in cheese and oxidation of butterfat.

Almost 13,000 pieces of dairy glassware were tested for compliance with the requirements of the Dairy Produce Acts, and 1,306 pieces (10.1 per cent.) were rejected for failing to meet the necessary standards. Despite the marked increase in the number of pieces tested, the standard of quality has been well maintained.

GENERAL.

Ten papers were prepared for publication in various Journals. Officers of the Branch have given lectures to dairy conferences, schools of instruction and branches of the Queensland Dairymen's Organisation.

MARKETING BRANCH.

Mr. H. S. Hunter, Director of Marketing.

MARKETING.

There are two predominant features in the current situation which have given direction to the economic information and analyses the Branch is called upon to supply and the work required of it in relation to the statutory marketing bodies with which it is associated.

Firstly, the overseas market has virtually completed the transitional period when change was the keynote and there is now emerging a pattern which short of a major upheaval could be the established order for some years to come. There is still an area of partial control in which agreements between Governments to a greater or lesser degree exercise a stabilising influence, as in sugar, wheat and meat, but in the main, rural industry has now to cope with open market conditions. As a consequence, matters of price, selling policy and quality are crucial, particularly since in the interests of the national economy there remains a need to maintain a high level of production.

Secondly, the technical developments in production, particularly mechanical harvesting methods in various crops, have so speeded up or altered the nature of the intake of goods by the marketing authority that considerable re-adjustment and expansion of facilities has been required as well as a definite re-orientation of thinking in relation to encouragements needed to ensure that quality is not sacrificed to speed. If to this is joined such developments as an expanding volume of production and radical changes such as the trend from bag to bulk handling, and regard is had to the rapid increase that has taken place in the whole tempo of commercial life made possible by the rapid advances in methods of communication, it is clear that a particularly dynamic situation now exists. This calls for a corresponding ability to provide the information and exercise the judgment necessary to meet it.

Overseas Market Situation.

Apart from its direct and indirect influence on rural industries the overseas market position is of particular importance at present because for the second time since the war there has been an unfavourable Australian balance of trade. The proportion in which the main rural industries contribute to merchandise exports from Australia is illustrated in Figure 1.

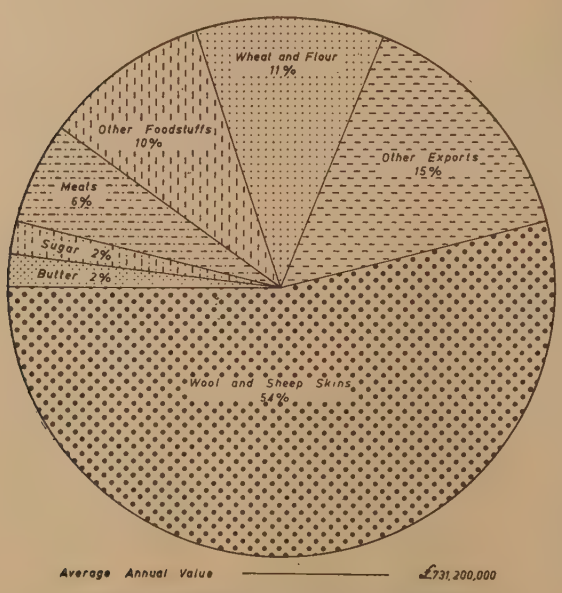


Figure 1. Dissection of Exports from Australia, 1949-50 to 1953-54.

The significance of lower realisations on wool (£8 million less than last year) is obvious from the above figure. This was the result of both lower values and lower volume of export despite the achievement of a record Australian wool production of 1,288 million lb. Queensland production increased by 4 million lb. to 171 million lb.

For industries such as dairying, where the year saw the end of the United Kingdom contract, poultry and eggs where the United Kingdom contract had previously expired, and grains where large stocks are held, the market situation has been difficult and uncertain.

Butter and cheese contract values were 3¾ and 7½ per cent. respectively below the prices negotiated for 1953-54 and were established at 392s. 6d. A.C. and 211s. 3d. A.C. per cwt. f.o.b.

Eggs and egg pulp prices fell approximately 5 per cent. and 27 per cent. respectively, the average return to the Australian Egg Board for eggs in shell having fallen from 3s. 5.453d. to 3s. 3.422d. per dozen and egg pulp from 3s. 2.75d. to 2s. 4.218d. per lb. respectively.

Wheat values were generally maintained between 14s. and 15s. per bushel f.o.b., with a slight improvement in sales on a still very weak market held together by the capacity of the three main exporters (U.S.A., Canada, and Australia) to hold large stocks.

The uncertainty of course was to be expected, particularly when the contrast is made with post-war years, though admittedly some commodities such as eggs and cheese have fared worse than others and have an outlook which is far from promising, mainly because of competition from soft currency countries.

Good clearances of canned pineapples were effected at prices on a level much the same as last year. By way of illustration, the price obtained for choice sliced pineapple on the United Kingdom market at the expiration of the contract on 31st December, 1953, was 16s. 6d. c.i.f. Stg. per dozen 16 oz. cans. The price after quickly rising to 21s. 6d. per dozen on the free market subsequently declined to 16s. 4½d. per dozen in October, 1954. The bulk of the 1955 summer pack realised 16s. 9d. per dozen cans.

Sugar cane production was more than a million tons greater than in the previous year and reached 9,876,000 tons. However, sales of raw sugar under the Commonwealth Sugar Agreement at annually negotiated prices reflect the effects of competition and increasing world stocks by a decrease from £41 to £40 15s. Stg. per ton c.i.f. for the 1955 season.

Competition has also had its effect in the meat market.

The Australian meat contract guarantees minimum prices up to 1967. However, it seems certain that this year average realisations will not reach the guaranteed levels and deficiency payments will be payable by the United Kingdom Government.

The effect that these changes in world prices have on the Queensland economy is demonstrated in Fig. 2, which shows the relative importance of interstate and overseas exports to Queensland in 1953-54 and compares total exports with total imports.

Commodity Markets.

Whilst the community generally is affected by the fall in export earnings, the immediate impact is felt more heavily by the primary producer. In Fig. 3, changes in the ratios of prices received to prices paid by farmers in Australia as a whole during the years 1950 to 1954 are shown. The trend in 1954 is indicative of the problem which confronts rural industry in its efforts to increase exports and so to restore the balance of trade.

Farmers' organisations are directly affected by this situation. It emphasises the need for maintaining high standards of quality and presentation as well as the utmost possible economy in handling, processing and transport.

As mentioned in last year's report, the international grain market has changed radically. Despite a substantial reduction in the size of crops in the major wheat exporting countries during the 1954-55 season, and some improvement in international wheat trade following poorer harvests in a number of importing countries, the total carryover in the hands of the major

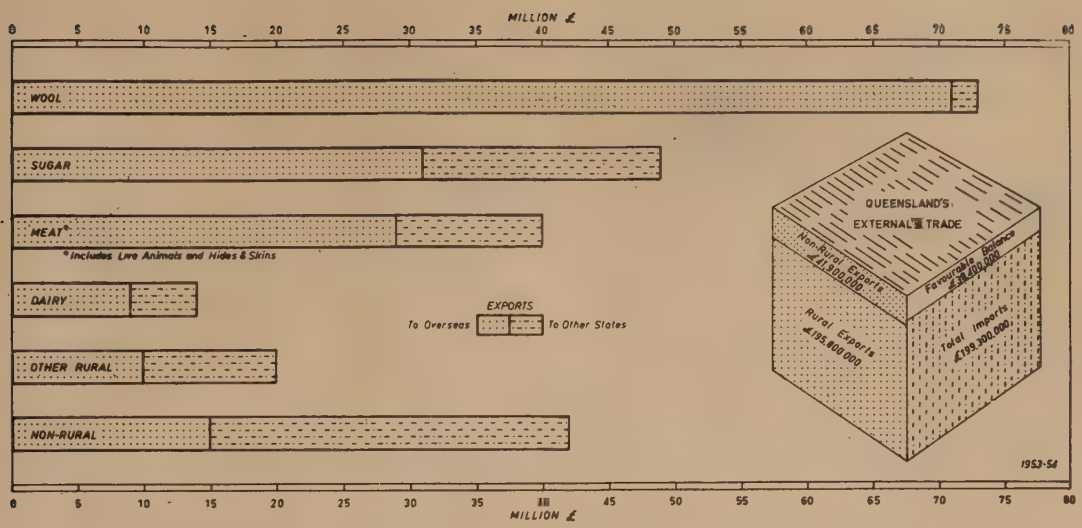


Figure 2.—The relative importance of various Queensland interstate and overseas exports 1953-54, also the relative values of rural exports to total exports and to total imports.

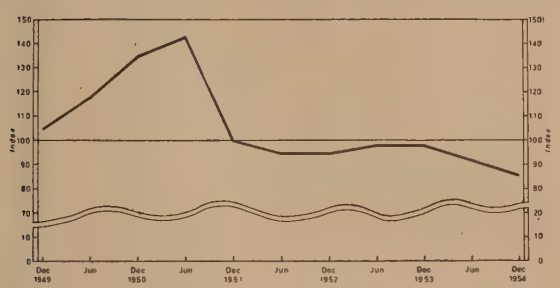


Figure 3.—Changes in the Ratio of Prices Received and Prices Paid by Primary Producers in Australia (all products).

wheat exporters this year is still expected to be about 1,500 million bushels, compared with 1,632 million bushels last year. This comparatively small reduction in stocks has done little to ease the wheat marketing situation, and notwithstanding the much smaller Australian wheat crop in 1954-55 the Australian carryover of stocks at 1st December, 1955, is expected to be about the same as it was the previous year. In Queensland the carryover could increase from 2.9 million bushels at 1st November, 1954, to 5.3 million bushels at 1st November, 1955.

Queensland, as the major source of quality wheat in Australia, is in a unique position at the present time when problems of quality are entering so largely into the grain marketing picture both in Australia and overseas. Efforts made to establish the overseas marketing of Queensland wheat on a quality basis have attained a measure of success, and our wheat and flour are now being exported at a premium over f.a.q. The premiums obtained to date, although relatively small, are nevertheless considered satisfactory in view of the fact that the main problem at present is to gain wider recognition of the premium quality of the wheat. In the period since the war Queensland has been a spasmodic exporter of wheat, but we are now at the stage where we can look forward to regular exports and the importance of establishing a reputation for quality at this stage cannot be overestimated. Associated problems of grading and storage are also receiving attention and the bulk handling installations at present under construction make provision for the segregation of quality wheats.

In common with wheat, the question of barley quality has also been a live issue both at home and overseas, and although it is only during the last few years that Queensland has been a substantial exporter of barley, the problem of quality has been given considerable attention. During the year The Barley Marketing Board introduced for the first time in Queensland the principle of segregating malting and feed barley for export and offering a grade of "Queensland 2-row Malting Barley" for overseas markets. Attention was also paid to packaging and for the first time only new sacks were used. As a result of these efforts, the barley was well received overseas and attracted prices commensurate with its malting quality, whereas previously our barley had only attracted "feed" prices. Endeavours are also being made by the Board to improve the overall quality of the Queensland crop through the distribution of high-grade seed. With this season's export totalling over one million bushels and evidence of further expansion during the 1955-56 season, the Board is faced with many problems associated with classification, storage, and handling.

A weakening in the market for small grains, such as canary seed and millet, and coarse grains, such as sorghum, has focussed attention on the need for closer attention to be given to quality. These grains afford very clear examples of the dangers associated with the speeding up of mechanical harvesting mentioned earlier. As a consequence, great care is now essential to ensure that the harvested seed is of a quality high enough to make it attractive to the buyer.

As mentioned earlier, some of our exports are meeting very strong competition, so returns from overseas sales tend to be at a lower level than those from local sales. As a consequence, efforts have been made to increase sales in the home market. However, experience has shown that home demand is rather sensitive to price changes, so increasing prices are accompanied by falling *per capita* consumption. This development has been particularly evident in dairying and farmyard products.

Fig. 4 shows actual consumption in Australia in 1952-53 of butter, eggs, meat and sugar, compared with the level which would have prevailed in that year had Australian pre-war (average 1936-37 to 1938-39) *per capita* levels been maintained. These consumption levels have been shown in relation to Australian production in 1952-53.

Although some marketing boards are not concerned with export markets, the industries they represent nevertheless have assumed increasing importance in relation to the balance of trade. Examples of such commodities are tobacco, cotton and oil-bearing seeds. Any increase in production of these will naturally result in decreased overseas spending on them.

The major feature of the tobacco industry during the year has been the greatly increased prices paid during the 1955 auction series. To 30th June, 2,677,853 lb. of leaf had been sold, realising £1,917,360, or an average price of 172d. per lb., compared with 133d. per lb. realised over the whole of the 1954 sales, when 4,145,975 lb. were sold for £2,302,280. The chief reasons for the high prices were the entry into the Australian manufacturing field of several large overseas tobacco companies with a consequent increase in competition and demand for Australian leaf for blending purposes, the purchasing of leaf to build up stocks, and the recently adopted policy of careful revision and adjustment of percentages of Australian leaf to be

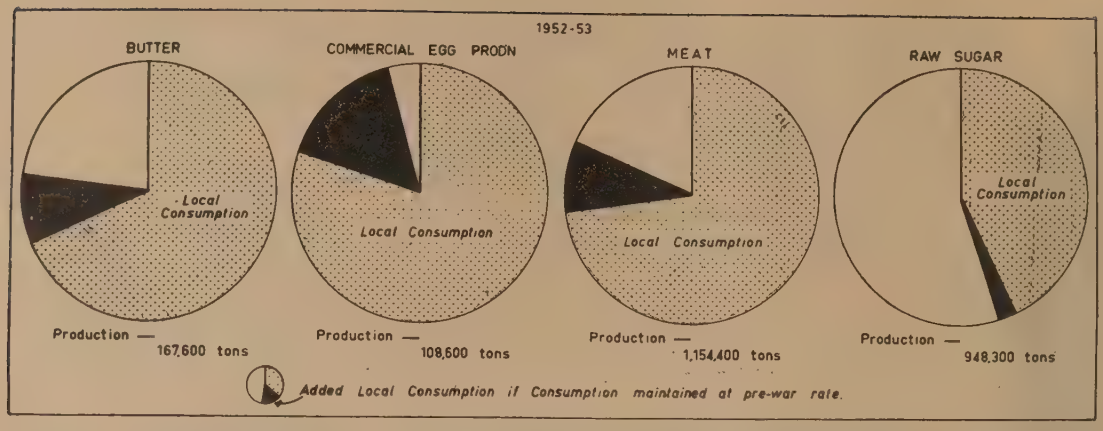


Figure 4.—Australian consumption as a proportion of production 1952-53, showing also added consumption which would have resulted had pre-war per capita consumption levels been maintained.

blended with imported leaf in order for manufacturers to qualify for concessional rates of duty on imported leaf. From 1st July, 1955 the percentages operating will be 17½ for tobacco and 7½ for cigarettes.

Quite apart from current price considerations, every effort is being made to provide a more stable basis for the tobacco industry in order to facilitate a steady expansion. Attention being given to quality, grading and presentation of leaf, expansion of irrigation facilities and efforts to obtain agreement on a price stabilisation scheme based on cost of production are some aspects from which the industry will gain future benefit.

As regards cotton, following favourable rains approximately 20,000 acres were planted for the 1955 season, an acreage higher than any other year since 1943, continuing the revived interest in this crop. Unfortunately, adverse weather has reduced the harvest prospects from 7,000 to 4,500 bales of raw cotton lint. The revival of interest has been further stimulated by the extension of a guaranteed price for another three years. The *Cotton Bounty Act*, 1955 guarantees a price (to be declared each year prior to planting) of not less than 9½d. and not exceeding 14d. per lb. seed cotton. The rate declared for the 1956 crop is 14d. per lb. The guarantee, however, by virtue of the fact that it is on a year-to-year basis, is not conducive to any long-range planning.

With a view to enabling production of ginger to be maintained in Queensland, the Ginger Marketing Board in the face of increasing competition from imports from low-cost countries sought increased protection on ginger preserved in brine or in syrup. Following a Tariff Board enquiry the tariff was substantially increased.

In addition to the foregoing review of marketing developments during the year 1954-55, a detailed description of the activities of the various commodity marketing boards operating in Queensland will, as in previous years, be given in the Annual Report by the Director of Marketing to the Hon. the Secretary for Agriculture and Stock, as required by *"The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1954."

ECONOMIC ANALYSIS AND STATISTICS.

The Crop Reporting and Forecasting Service has continued throughout the year. No new crops were added to the service, which comprises wheat, barley, maize, grain sorghum, potatoes, tobacco leaf, peanuts and eggs.

Crop Reports.

During the year special attention was given to the procedures followed, particularly in the case of grain crops. In view of the developments and of the changes taking place in these industries, such as the growth of the barley industry and the greater significance of Central Queensland, the situation presented to the forecaster is a particularly dynamic one and calls for close attention to these changes.

Then again, a further difficulty arises from the delay in the publication of official production statistics. The Government Statistician conducts an agricultural production and land usage census at 31st March each year. Allowing for the necessary delay in processing these figures, statistics are not available until the latter part of the year. The difficulty with the summer grains is that 31st March falls in the middle of the harvesting period, so the figures collected are those relating to the previous year's crop. This creates a special problem with crops such as grain sorghum, which are not subject to any statutory control, and maize, which is marketed through a board only on the Atherton Tableland. All the other crops comprised in the forecasting service (except potatoes) are commodities for which marketing boards are established under the Marketing Acts. Up-to-date delivery records obtained from the marketing boards are naturally of great assistance to the forecaster and reduce considerably the probable margin of error in the forecasts. This means that a forecaster preparing a report in December, 1954, forecasting maize or grain sorghum production for the 1955 harvest, has no official statistics to guide him later than the 1953 harvest. All he knows of the 1954 harvest is his forecast for that year.

The basis of all this Division's agricultural area forecasts is a comparison with the acreage for the previous season. Each crop correspondent reports the variation in acreage which has occurred in his own locality. From these locality reports are estimated district and State acreages. With these summer grains, the only comparison available is with the previous season's forecasts.

These considerations make it essential that the sample of reporters for maize and grain sorghum be fully representative at all times. This requirement applies of course to all crops, but the consequences of its neglect may be more serious in respect of the summer grains. Maintaining a representative selection of active crop correspondents is one of the difficulties of crop forecasting. The whole system is dependent on the continued co-operation of a number of voluntary, honorary crop correspondents. The list of farmers assisting in this manner is continually changing as farmers leave the industry or for some other reason cease to co-operate, and other growers are appointed in their place. There is also the fact that a small percentage of correspondents fail to complete the questionnaire at each survey because of temporary absence from the farm, illness or some other reason.

But the main difficulty is associated with variations in the geographical distribution of the crop. This factor is particularly important in respect of grain sorghum. There has been a spectacular expansion of this crop in the Central Queensland Highlands and in the Dawson-Callide Valley, where correspondents have been somewhat scattered.

In the past, appointments of new correspondents have usually followed recommendations by field officers of the Division of Plant Industry or visits to the producing areas by the officers engaged in crop forecasting. A new procedure was adopted this year. The sample of growers reporting on the maize and grain sorghum crops was completely overhauled in collaboration with the crop correspondents themselves and also many Secretaries of Grain Growers' Associations. Excellent co-operation was given by these people. Some of the farmers have been reporting for six, seven and even eight years, and

their long and practical experience has been of great benefit to this Division. In this instance the advice received from them was most helpful and illustrates the continuing goodwill and co-operation of the producers, which are essential in the maintenance of an effective crop forecasting system.

It is felt that the sample that has emerged from this joint revision by Divisional officers and crop correspondents should be more representative than it was previously. Out of 166 correspondents for maize and/or grain sorghum prior to the revision, 36 have been removed from the list because of irregular submission of reports, and 68 new correspondents have been enrolled, making a present total of 198. This is a net increase of 32, but the gain has been not only in numbers but in a wider coverage of the growing areas. It must be remembered that each of these 198 farmers reports on his locality, which may comprise up to 20 farms, and not merely on his own farm operations.

Poultry Report.

The scope of the quarterly Report on Poultry Industry was expanded during the year; more detailed price information is now shown in respect of feed, eggs and poultry. Arising out of statistical data obtained for this report, a separate study was made by officers of the Marketing Branch of some special aspects of the rate of lay and the egg-feed ratio, and their effects on the profitability of poultry farming. This study was published in the *Queensland Agricultural Journal*, and was subsequently reprinted in poultry industry journals in Queensland and other States. This work aroused widespread interest as it revealed, *inter alia*, an average rate of lay in Queensland of 168 eggs per annum, which was significantly higher than the previously accepted figure of 144. As the rate of lay is a crucial factor in egg production costs this result has caused some re-orientation of thought on the economics of the poultry industry. The study was of value to the Bureau of Agricultural Economics in its recent survey of the poultry industry, and reference is made to it in its Report.

Linseed.

Towards the close of the year, widespread interest in linseed planting and reports of large-scale expansion following the tabling of the Tariff Board's Report in the Commonwealth Parliament made it desirable to have an urgent assessment made of the extent of plantings in Queensland. The crop forecasting organisation, which includes approximately 300 farmers throughout the grain growing areas of the State experienced in this type of observation, provided a unique basis for making this assessment with speed and accuracy. A questionnaire was despatched to these grain crop correspondents just prior to the completion of the financial year.

Report on Production Trends.

Crop reports are keenly sought by Government and trade circles who are closely connected with the particular industry. Of perhaps more general interest, however, is the Report on Production Trends. This is published monthly within two or three weeks of the close of the period of the report. It includes summarised versions of the most recent Crop Reports and Forecasts, and a wealth of information supplied by the Divisions of Animal Industry, Plant Industry and Dairying, the Commonwealth Meteorological Bureau, the Bureau of Sugar Experiment Stations, marketing boards and cold storage firms.

Price Series.

Further work has been done on the analysis of wholesale prices of fruit and vegetables with the object of discovering and explaining trends and seasonal patterns. These studies are issued as supplements to the *Report on Production Trends*. During the year supplements were issued on papaws and pumpkins. The complete list of price series issued to date includes pineapples, lucerne, oranges, tomatoes, beans, peas, bananas, apples, papaws and pumpkins, while further crops are at present being studied.

Market Price Reports.

The statistical information collected, recorded and collated by the Market Price Reporters is published in the *Daily Official Market Quotations* and the *Weekly Market Report*. These reports continue to provide topical information on the tone and tendencies of the market for fruit, vegetables, farm produce and miscellaneous commodities. Daily reports are published in the press but probably receive their widest publicity through radio stations. Farmers and others dependent on the markets for their livelihood exhibit a keen interest in these reports.

The weekly report has a broader basis and deals more fully with general tendencies. As such, its value to the supplier is perhaps greater than the daily quote and because of this it receives wide publicity in the country press and growers' periodicals.

Publications.

An important function of the Marketing Branch is the dissemination of information of economic and statistical value. The distribution of topical and instructive material apart from the regular reports referred to above is also undertaken in the interests of primary producers. The reliance placed on this Branch for economic guidance both by rural industry and commercial enterprises supplying their wants can be gauged by the number of issues of various publications during the year, as shown hereunder.

Type of Report.	No. of Issues.	Average No. of Pages.	Regular Distribution.	Annual No. of Copies.
Daily Market Prices	256	3	200	51,200
Weekly Market Prices	52	10	110	5,720
Production Trends ..	12	18	700	8,400
Wheat	3	11	530	1,590
Maize	3	10	530	1,590
Grain Sorghum ..	3	11	560	1,680
Barley	3	6	460	1,380
Potatoes	4	4	380	1,520
Peanuts	2	5	420	840
Tobacco	2	4	370	740
Poultry Industry ..	4	11	650	2,600
Price Supplements ..	2	15	770	1,540
Articles of Economic interest	6	3	880	5,280
				84,080

Economic Data.

A developing feature of the Branch's work is concerned with supplying the demand from the general public for economic and statistical information. The dynamics of modern business have produced an awareness of the value of statistics. Businessmen, whether producing or processing commodities, or selling goods or services, are finding it increasingly necessary to be fully apprised of the economic situation in which they are operating.

The Marketing Branch is being recognised to an increasing extent as a source from which current economic and statistical information relating to rural industry can be obtained; and in a State such as Queensland where the economy is dependent primarily on its rural industry there are very few types of undertakings which do not need some information of this nature.

Requests for historical statistics of acreages, production and prices for specified commodities and for localised areas are common, but there has been a marked increase over recent years in requests for statistics of a more elaborate nature—trends, estimates and forecasts.

Typical of the classes of persons requesting this information are farmers considering production programmes or seeking markets for their crops, persons considering farm purchase, oil companies contemplating establishment of country depots, bankers considering propositions by clients, seed and produce merchants looking for sources of supply, machinery and motor car firms and home appliance distributors planning sales programmes, radio stations and newspapers preparing news and feature items, marketing organisations, students, schoolteachers and University staff, and Government Departments concerned with social services, employment, taxation, commerce, agriculture, &c.

In the last category, for instance, is a regular report forwarded quarterly to the Bureau of Agricultural Economics setting out prices paid and received by farmers for a comprehensive list of commodities. The information in this report, much of which consists of primary statistics originating in the Marketing Branch, is incorporated with similar information from other States and published quarterly by the Bureau.

Some of this type of enquiry is made by mail, but a good deal is requested by personal interview or telephone. There is obviously a need by the community for sound economic information, and it is felt that the time spent by officers in this type of work has a widespread value.

GENERAL.

Overseas Visit of Director.

During the year the Director of Marketing visited several overseas countries with a view to obtaining first-hand knowledge of developments in organisational practices and marketing techniques. This was made possible by the finance provided by the constituent Boards of the Council of Agriculture and the State Government together with a generous contribution of £500 by the Commonwealth Bank of Australia. A considerable amount of information was gathered from a diversity of sources and this is now being collated and forwarded to the interested parties for the benefit of the various industries concerned.

Legislation.

During the year the Primary Producers' Organisation and Marketing Acts were amended to bring certain sections up to date or into line with present-day needs. These amendments covered such matters as the constitution of the Council of Agriculture and its Executive Committee, the appointment of deputies for the Director of Marketing, the winding-up of Boards, and auditing of the books of sugar industry organisations.

Wheat.

Officers of the Branch were again engaged on investigations and in attending conferences in connection with efforts to formulate a wheat industry stabilisation scheme to replace that which expired with the 1952-53 season. A scheme satisfactory to all States, the Commonwealth and the wheat growers was finally evolved and is now in operation. The scheme, which provides for a guarantee to growers of cost of production on up to 100 million bus. export, and a stabilisation fund financed by means of an export tax when export prices exceed cost of production, covers the five seasons 1953-54 to 1957-58 inclusive.

During the year further progress was made with the erection of bulk handling facilities at country centres in Queensland and it is anticipated that additional bulk storage totalling 1 million bus. with complementary handling equipment will be available in time for this year's harvest, which is due to begin in October. The erection of silos at country centres will continue during the coming year and the present programme provides for a further 600,000 bus. in storage capacity in addition to the 1 million bus. mentioned above.

Tenders were recently called by the State Wheat Board for the construction of a bulk wheat export terminal at Pinkenba, but although they have now closed no contract has yet been let. With the increase in carry-over stocks in Queensland the necessity of providing bulk handling facilities has been accentuated. This, together with the transport of wheat, is thus assuming even greater significance as a marketing problem.

Grain Sorghum.

Statutory marketing boards exist for wheat, barley, and maize (in North Queensland), but other grains have been marketed by independent merchants, brokers and voluntary co-operatives. During the year, however, representations were made by the Queensland Grain Growers' Association for the setting up of a statutory board for the marketing of grain sorghum. The setting up of a board under the Primary Producers' Organisation and Marketing Acts has been approved in principle. Before the board is set up the growers will have the opportunity of requesting a ballot on the question.

Milk Organisation.

Following proposals submitted by the Queensland Dairymen's State Council, a sectional milk producer organisation has been set up within the Queensland Dairymen's Organisation to deal with matters relating to milk supply for the liquid milk trade for a trial period of 12 months.

Tobacco.

During the year the tobacco industry's attention has been devoted to certain preliminaries which will be essential in the operation of any stabilisation plan. It has been recognised that leaf quality, methods of presentation and a system of grading equitable to growers and manufactures alike are questions basic to the future of the industry. Many conferences and discussions took place during the year on such matters as minimum grades, the revision of the grading schedule, effective leaf presentation and display, selling methods and methods of instructing growers in manufacturers' requirements.

A new selling floor in Brisbane, built by the South Queensland Tobacco Growers' Association with funds guaranteed by the Government, was opened during the year and has proved to be a considerable improvement on the facilities previously available, enabling the leaf to be examined under adequate lighting and with ample space for the movement of operatives. Office rooms and staff amenities and a first class up-to-date auction room have also been provided.

Barley.

Considerable attention was devoted to the barley industry during the year and assistance afforded the board in organising the intake of the record crop harvested. For the first time Queensland barley was sold on the overseas market as malting quality; it received favourable comment from buyers.

Organisations.

Discussions have taken place between potato growers' organisations and the Department in regard to the setting up of a non-marketing organisation that would give producers the benefit of having a single voice in their relationship with Governments and the industry in other States. This is allied to proposals for the levying of growers to create a fund with which to finance research into the industry's problems in regard to such matters as cold storage, seed supply and pest and disease control.

PRIMARY PRODUCERS' CO-OPERATIVE ASSOCIATIONS.

The only new association registered under the Primary Producers' Co-operative Associations Act during the year was Maranoa Abattoir Co-operative Association Limited, which has been formed by graziers in the Maranoa district with the object of erecting and operating an abattoir at Roma to supply both the domestic and the export market.

Established associations have continued to consolidate and expand their activities, and in so doing have faced up to the need for increased capital funds to meet the high cost of replacement of machinery, plant and buildings, and provision of additional facilities required to cope with increasing business.

Apart from voluntary subscription for shares by members, methods employed by primary producer co-operatives in raising capital funds include the distribution of profits or portion of profits in the form of bonus shares in lieu of cash, the operation of revolving levy fund schemes, and proportionate shareholding whereby members are required to subscribe for shares according to the value of produce delivered.

Meetings were held regularly during the year of the Co-operative Advisory Council set up under the Co-operative Societies Acts and were attended by the Registrar of Primary Producers' Co-operative Associations as the representative of the Department.

STANDARDS BRANCH.

Mr. F. B. Coleman, Standards Officer.

During the year 340 sellers of agricultural requirements were visited, inspections covering the coastal area and near-inland districts from the New South Wales border to north of Cairns and as far west as Dalby.

Seed cleaning machinery and its associated equipment have gained popularity over the last 12 months and at the present time there is a steady demand for new equipment. Fifty-four seed cleaning machines of various sizes are now in operation on seed sellers' premises throughout the State, ensuring better quality seed being available to the purchaser.

The seed testing equipment has been modernised by replacing the former galvanised trays and glass tops with pressed aluminium trays with clear perspex lids. These trays are free from evaporation difficulties, are insect proof and are convenient to handle.

At the 1954 Brisbane Exhibition the Branch staged an exhibit stressing the deleterious nature of thornapples (species of *Datura*).

Articles entitled "Registered Stock Foods" and "Saving on Fertilizer and Lime Freights" were contributed to the *Queensland Agricultural Journal*, the former being issued as a supplement to the Journal.

SEEDS.

Table 1 sets out details of seed samples examined at the Brisbane Seed Testing Station.

As the number of samples examined includes a large percentage of farm seeds, such as grasses, lucerne, millets and sorghums, which involve complex purity analysis, a true comparison of the work from year to year cannot be based on total numbers.

TABLE 1.

SUMMARY OF SEED SAMPLES EXAMINED.

Samples Received from.	1953–54.	1954–55.
Inspectors of Branch	2,586	3,547
Seed Certification Officers ..	296	236
Sellers	3,920	4,643
Buyers	130	176
Government Departments ..	900	1,123
Experimental test samples ..	1,025	851
Total samples examined ..	8,857	10,576
Inspectors' samples which failed to comply	346	671

Samples received from sellers in the past averaged 2,500 per annum, but as a result of constant demand for better seeds, sellers paid for reports on 3,920 and 4,643 samples in the last two years respectively.

TABLE 2.

ACTION TAKEN ON UNSATISFACTORY SEEDS.

—	1953–54.	1954–55.
Cleaned under the supervision of an inspector—		
Farm seeds	157 bags	303 bags
Destroyed or otherwise rendered unsuitable as seed—		
(i.) Farm seeds	187 bags	120 bags
(ii.) Vegetable seeds ..	3,621 lb.	4,873 lb.
(iii.) Packeted seeds ..	22,579 pkts.	7 pkts.
Processed for stock food—		
(i.) Farm seed	..	564 bags
(ii.) Vegetable seeds ..	..	3,960 lb.

Table 2 shows that during the year 303 bags of farm seeds were cleaned under supervision in order to reduce the presence of weevils and then were dusted with BHC. Other quantities of material contained prohibited seed. Some Mitchell Grass seed (113 bags) was destroyed due to lack of germination, and 20 bags of French bean seed were destroyed on account of poor germination. In addition, it is known that large numbers of packet seed were destroyed by the sellers concerned when germination was shown to have declined.

CERTIFIED SEED.

Table 3 sets out the amounts of certified seed produced since 1952, together with the amounts rejected because of low germinability or the presence of prohibited seeds or excessive inert matter.

TABLE 3.

PRODUCTION OF CERTIFIED SEED.

Crop.	1952.		1953.		1954.	
	Certified.	Refused.	Certified.	Refused.	Certified.	Refused.
	Bus.	Bus.	Bus.	Bus.	Bus.	Bus.
Hybrid Maize ..	3,584	111	7,901	985	8,153	1,248
Grain Sorghum	4,871	995	5,091	4,662	14,831	..
Sweet Sorghum..	207	320	57	18	134	..
Sudan Grass ..	2,074	587	..	..	123	230
French Beans ..	60	..	312	326	14	5
Cowpeas ..	102	..	431	..	..	..
Tomato	318¾ lb.	9¼ lb.	75lb.	33 lb.	61½ lb.	..

Harvesting of the current crop of hybrid maize for certification is far from completed, but indications are that the total yield will be considerably below the 8,153 bus. certified for the previous year. This is partly due to the decreased acreage planted and partly to damage caused by the devastating cyclonic rains early in the year.

A substantial carry-over of certified hybrid maize seed again occurred and steps are being taken to retest for germinability to ascertain if the seed is in a satisfactory condition for it to remain certified.

During 1954 some 1,248 bus. of hybrid maize seed were refused certification, due principally to the germination being below the minimum for certified hybrid maize seed. It is apparant that greater care could be taken in the treatment of the seed from the time of harvesting, as with mechanical harvesting (picking and shelling) all seed irrespective of whether it is weevil damaged or diseased will be harvested and such seed is not always easily removed in cleaning, However, some growers are paying more attention to this matter and have installed machinery which has greatly improved the quality of their seed.

Table 3 indicates that a large increase in the amount of grain sorghum seed certified took place during 1954 and a reasonable carry-over of seed is now held in storage.

The variety Sweet Sudan grass was grown during 1954 for the first time for seed production. Unfortunately, the seed failed to reach a standard suitable for certification.

The production of certified bean seed has been replaced by a scheme which envisages the sowing of up to 25 acres of one acre each for the production of certified mother bean seed. This seed will be supplied to *bona fide* seed producers for the production of commercial seed for sale to green bean growers. The scheme, although in its infancy, has shown promise.

The cowpea variety Soutter was included in the certification scheme but due to adverse weather conditions no seed was available for certification.

It appears that in the main the demand for certified tomato seed can be met by seed producers and no great trouble is experienced with production.

MATERIAL OTHER THAN SEEDS.

Of the 380 samples of material other than seeds obtained by Inspectors, 20 fertilizer and lime and 49 stock food samples failed to comply with either the prescribed standards or their manufacturers' guarantees. Suitable action was taken where deficiencies occured.

TABLE 4.

SUMMARY OF ACTION ON MATERIALS OTHER THAN SEEDS.

—	1953–54.	1954–55
Samples received from—		
Inspectors	364	380
Buyers	..	10
Seized (bags)	295	13
Destroyed (bags or bales)	295	110

Destruction of 26 bottles or packages of veterinary medicines was effected and 34 bottles were withdrawn from sale; 110 bales of straw heavily infected with mould were destroyed.

REGISTRATION.

During the year, applications for the registration, re-registration or further registration of 2,291 agricultural requirements were received, compared with the previous year's total of 2,137.

The Agricultural Requirements Board reported on the efficacy of 774 preparations, of which 352 were pest destroyers and 422 veterinary medicines. Ten pest destroyers and 4 veterinary medicines were refused registration.

A 3-year registration period for pest destroyers commenced this year and all such preparations are being reviewed.

A number of preparations based on modern chemicals is being introduced into Queensland. These chemicals include methoxychlor, chlordane, toxaphene, dieldrin, aldrin and endrin. Modern formulae and new preparations keep pace with discoveries and trends of thought in this field.

Since the Agricultural Standards (Stock Foods) regulations were introduced the formulae for many stock and poultry foods have been reviewed to ensure that they comply with the prescribed standards for various mashes and meals.

The addition of vitamin concentrates to poultry mashes is extensively practised and supplementary minerals are included where necessary.

The Queensland fertilizer manufacturing industry has made considerable progress since 1939. Mixing plants then totalled 4; to-day such plants are working at Stanthorpe, Brisbane, Mackay, Townsville and Cairns, and number 7 with 2 additional plants under way. In 1939, Queensland superphosphate supplies were processed in New South Wales; they are now made at Brisbane and Cairns. This decentralisation is to the growers' advantage as it enables freshly mixed fertilizers to be readily available. It also saves long haulage and freight.

Sulphate of ammonia, our principal nitrogenous fertilizer, is still obtained from the southern States or overseas. Potash comes from Europe.

Superphosphate and mixed fertilizers are now available in granulated form.

TABLE 5.
FERTILIZER PRICES.

Name.	1938. February.	1954. May.	1955. March.
	£ s. d.	£ s. d.	£ s. d.
Nitrate of Soda (16%) ..	13 0 0	..	37 10 0(a)
Ammonium sulphate (20·5%)	12 0 0	27 0 0 (a)	37 10 0 (a)
Superphosphate (22%)—			
Jute Bags	5 6 6	11 8 6 (b)	11 16 0 (b)
Paper Bags	..	10 13 0 (b)	11 0 6 (b)
Granulated—			
Jute Bags	..	..	12 6 0 (b)
Paper	..	..	11 10 6 (b)
Blood and Bone (5/15) ..	7 10 0	25 4 0 (c)	25 4 0 (c)
Potash—			
Muriate (60%)	..	32 0 0 (c)	33 0 0 (c)
Sulphate (48%) ..	15 10 0	37 15 0 (c)	40 5 0 (c)

(a) Less 7s. 6d. for cash. (b) Less 5s. for cash. (c) Net.

LIMES.

There are 27 limes registered in Queensland. These include burnt lime, hydrated lime, magnesium lime, processed lime, pulverised limestone, slaked lime, and earthy lime.

SEED IMPORTS AND EXPORTS.

Details of the goods examined at the port of Brisbane for the purpose of the Quarantine Act and/or Commerce (Trade Descriptions) Act are set out in Table 6.

TABLE 6.
SEEDS EXAMINED.

Kind of Seed.	1953–54.	1954–55.
Imports—		
Farm Seeds—		
Beans (sacks)	..	3,394
Grass (sacks)	..	20
Legumes (sacks)	21	20
Miscellaneous (sacks) ..	37	82
Vegetable—		
Miscellaneous (lb.) ..	54	1,069
Parcel post (parcels) ..	24	219
Peas (sacks)	341	286
Exports—		
Grasses—		
Paspalum dilatatum (sacks)	826	3,363
Rhodes (sacks)	..	83
Miscellaneous (sacks) ..	..	41
Legumes (sacks)	..	10
Miscellaneous (sacks) ..	..	1

GRAIN EXPORTS.

Reports were issued on 1,041 samples of grain submitted by shippers or agents, in connection with which the buyers' terms of contract stipulated that a Government certificate be issued. Of this number 72 samples were found to contain seeds of *Datura* spp., a poisonous weed prohibited in Queensland in both seeds and grain.

CLERICAL AND GENERAL DIVISION.

Clerical and General: Mr. H. Barnes, Special Administration Officer.
Extension Consultant Service: Mr. G. R. Moule, Extension Co-ordinator.

CLERICAL AND GENERAL.

The services of the administrative Assistant Under Secretary (Mr. W. T. Gettons) have been made temporarily available to the Queensland Meat Industry Board, of which he is also a Member, and as a consequence the report on clerical and general activities has been prepared on this occasion by the Special Administration Officer, who has taken over the duties of his Departmental position.

Staff.

There are now 1,074 employees attached to the Department compared with 1,000 at the end of June 1954. The total includes temporary employees and wages hands, but does not include 120 seasonal workers employed on sugar-cane testing duties at various sugar mills. The clerical staff numbers 195, of whom 84 are males and 111 females. All of the male clerks with one exception are attached to Head Office, as are also 69 clerk-typists and assistants. The remainder are divided amongst 28 country branches.

The demand for more clerical staff still exists despite a numerical gain during the year. Some Branches have clerical vacancies which have remained unfilled for a long time. The need for more clerical staff is also a corollary of the expansion of the Department's technical activities.

Thirty-four new clerical appointments were made during the year, and though this would suggest that the staff shortage was being generously catered for, much of the advantage was offset by the resignation of 21 clerks and clerk-typists. Of the gain of 13, six were appointed to Head Office and seven clerk-typists to country offices. Vacancies still exist at seven other country centres and there are several at Head Office.

Efforts have been continued to effect greater economy of working by streamlining some office procedures. The staff has co-operated well and as a consequence there has been a general improvement. There has been a speeding-up in the handling of correspondence, the despatch of outward mail and the ordering of materials and supplies.

Records.

The growth of the Department is illustrated by the annually increasing volume of correspondence handled by the Records Section. The number of inward letters received was 89,631, whilst 10,964 intra-Departmental memoranda and 53,403 outward letters were recorded. This was nearly 9 per cent. more than in the previous year. Much of the additional work in the Records Section devolves upon the three registration clerks. It is significant that during the first six months of 1955, 24,500 new files were started, compared with 21,000 during the same period of the previous year, an increase of more than 16 per cent. In order to ensure that delay does not occur in this Section and that correspondence is handled with reasonable speed, provision has been made to increase the number of registration clerks to four.

Accounts.

The total expenditure of the Department for the year was £1,862,230, compared with £1,656,852 for the preceding 12 months, whilst receipts totalled £1,057,780, as against £1,044,123.

It is only by the aid of modern accounting machines that the Accounts Branch has been able to cope with the additional work required in that section. A comparison of the years 1951-52 and 1954-55, for example, shows that the number of vouchers paid (exclusive of 3,350 salary vouchers) increased from 21,709 to 30,260, the number of cheques drawn from 38,462 to 45,036 and the number of receipts issued from 15,558 to 19,301.

Expenditure under the Grade Herd Recording Scheme and the Tuberculin Testing Scheme shows how these projects have expanded. In the case of the former scheme, expenditure in 1951-52 was £34,892 and in 1954-55, £59,138. In the case of the T.B. scheme, expenditure increased from £21,752 to £97,984 during these years.

Commercial and Despatch.

The growth of the multifarious duties performed by the Commercial and Despatch Branch has made it necessary to add to the staff of the purchasing and stores sections. Latterly the State Stores Board has adopted a policy of placing more items under contract, and this, added to the authority which exists to make any general purchase up to an amount of £5, has made it possible for many orders to be placed direct with suppliers. Equipment and materials such as farm tools, tractor parts, motor accessories, and urgent requirements of seeds and stock feeds are now procurable without prior reference to the Board. This has resulted in speedier delivery of goods and a saving of discounts. The number of orders issued during the year was 8,971, compared with 5,702 in 1951-52.

The cost of postage for letters, telegrams and parcels amounted to £5,884, compared with £4,621 in 1951-52. The increase was partly due to higher postage rates, but was also attributable in part to the greater volume of correspondence passing through the Despatch section. A considerable saving of time and postage has been effected by the introduction of a system whereby all first class mail for the larger country branches is posted daily under one outer cover. In reverse, all mail from the larger country centres for Head Office is similarly enclosed daily in one envelope.

Consignments of parcels and goods by rail numbered 7,195 for the year, whilst the Branch also made 696 bookings for personal travel by officers by rail, air and sea.

An inventory of all furniture, materials and equipment owned by the Department is rapidly being brought up to date in accordance with the requirements of the Auditor-General. A visual check has been made of all items at Head Office, whilst senior officers are checking all listed items in country offices and at experiment stations.

A steady demand continues for Volume III of the Queensland Agricultural and Pastoral Handbook, and of 5,000 printed in 1952 only 1,270 copies remain.

A problem associated with the growth of the Department is that of providing office accommodation and storage space. For a number of years recourse has been had to various expedients to accommodate additional officers, equipment and materials in already overcrowded space, particularly at Head Office. Saturation point has now been reached and other accommodation will be essential as the Department continues to grow.

Transport.

Forty-nine new motor vehicles were purchased during the year. The majority of them replaced worn-out vehicles condemned by the Chief Inspector of Machinery, and 15 were obtained from Commonwealth Funds. There are now 252 Q.G. motor vehicles attached to the Department, and in addition 248 officers use private cars for official purposes.

EXTENSION CONSULTANT SERVICE.

Two factors have for some time served to emphasise the need for greater consolidation of the Department's extension efforts—the growing public demand for technical assistance, and the shortage of staff within the Department.

Knowledge of modern extension techniques was acquired by the Extension Co-ordinator in 1952 on a visit to the United States of America. A grant covering expenses was made available through U.S. Public Law 402, which is designed to facilitate international exchange. In May, 1954, financial support was received from the Commonwealth Government for the inauguration of an Extension Consultant Service, under the Commonwealth Extension Services Grant. The Information Services, the Photographic Service and the Library were consolidated under the Extension Consultant Service. Simultaneously an extension officer was appointed.

The aims of this service were to be threefold:—

(1) To assist in co-ordinating extension activities throughout the Department.

(2) To train staff in extension methods.

(3) To serve as consultant to the Divisions and Branches in programme planning and all extension activities.

Co-ordination of Extension Activities.

As a first step in the co-ordination of extension programmes, the Service compiled, with the aid of Divisional and Branch heads, a record of the extension work in progress throughout the Department and the resources available. No less than 75 separate programmes were recorded in this way.

In the process of charting these programmes, attention was focussed on the difficulties arising from staff shortages within the Department, and the vital need to preclude unnecessary activities. Far from being a radical departure from established practice, extension of one kind or another existed in all contacts between the Department and the producer, and it was evident that present difficulties could best be overcome by increased efficiency in extension methods.

In recording programmes, particulars of available staff, financial backing, and extension media being employed were noted. In addition, reference was made to the part each Branch was playing in the overall Departmental programme of fodder conservation. The aim here was to avoid any overlap in activities and, conversely, any gap in the pattern of support.

In connection with the overall Departmental programme of fodder conservation, the Service has worked hard to secure the adoption of certain basic steps in programme building. In essence, these call for the marshalling of available information; the study of human, technical and economic considerations; and the presentation of a conclusive case in favour of the practice to be recommended.

To assist in the correlation of activities associated with the fodder conservation programe, an agronomist was transferred to the headquarters of the Agriculture Branch.

Training Staff.

One of the first duties of the Service was to organise a school in extension methods for Departmental officers. The duration of the school was three weeks and attendance comprised 26 officers and three leaders. Its aim was to impart knowledge of up-to-date extension techniques applicable to Australian conditions.

The lectures dealt with many aspects of extension: its history, *raison d'être*, underlying psychology, teaching methods, concept of programme building, place in the social structure, etc.

As an assignment, the officers took it in turn to present one particular method of extension. From the impact of this presentation upon their audience, they were able to judge their adequacy as public speakers.

Specialised topics were dealt with by a series of guest speakers, all of standing within their professions.

To give officers experience in chairmanship, they were elected in turn to preside over sessions of the school. The discussion periods which were a feature of each day's work provided a useful exercise in controlling a meeting.

Human relations techniques—good and bad—were reviewed in the course of "role playing" between officers, and tuition was given in the correct use of film projectors, tape recorders, and other extension aids.

For the most part evenings were given over to the preparation of written assignments on extension methods already elaborated in the course of lectures.

An attempt was made to evaluate this school in a scientific manner. At the beginning and end questionnaire forms were distributed, and answers to these provided an index of the changes in attitude that had resulted.

Certain points emerged from an overall study of assignments, questionnaires, and the trend of feeling during discusion periods. Some officers, it was clear, had not previously given the attention they might have done to the attitude-forming aspect of their work; first contact with the countryman had often been at action level.

A shift of opinion was noted in favour of participating with the producer. The need to prepare matter for the countryman in a form readily assimilated by him seemed also to be understood, together with the reciprocal need for a free flow of ideas and problems back from the producer to the research worker. It was acknowledged, too, that in spreading the fruits of rural achievement there was a bilateral effect, in that a self-reliant spirit was regenerated among producers. Programmes themselves, it was generally agreed, were useful instruments of the extension service, but at all times the emphasis in planning must be upon the betterment of life and work among rural people.

Consultant Activities.

Throughout the year the consultant service has supplied equipment, literature and advice on extension techniques to all Branches inaugurating programmes of their own.

Upon the return of their representatives from the October school in extension methods, the Division of Dairying instituted a series of lectures designed to bring to their field officers knowledge of the techniques acquired. The Extension Consultant Service was able to help in this by supplying discussion sheets and other lecture material. It was able to lend support, also, to producers' schools, such as the schools for woolgrowers at Mitchell and Barcaldine arranged by the Sheep and Wool Branch. At the former school an officer of the Extension Consultant Service attended as an observer and later compiled a preliminary survey of the results as an aid to future planning in this field.

Publications.

One of the best potential chanels for disseminating information to the producer is undoubtedly the *Queensland Agricultural Journal*. In view of this, steps have been taken during the year to strengthen its appeal to rural people. The somewhat formal style has been modified and the range of subjects extended in order to make it acceptable to a wider public.

Annual circulation has now reached 15,500 copies, and about a third of the farm homes in the State are contacted. During the year interest in irrigation and pasture improvement has been particularly keen, and a considerable amount of well-illustrated material on both topics has been included in the journal.

Reprints from the journal provided over a quarter of a million copies of advisory articles. Of these articles, 60 had originated in the Division of Plant Industry, 40 in the Division of Animal Industry, and 14 in the Division of Dairying.

The number of copies printed and articles supplied is far in excess of previous years, and reflects the beneficial effect of changes in the journal, and also the growing public demand for information. To meet this demand there are now about 500 different leaflets available of interest to farmers, graziers and home gardeners.

The Department's scientific quarterly, the *Queensland Journal of Agricultural Science*, has completed its eleventh year of publication. This journal reports the result of scientific work for the benefit of research workers throughout the world. Printed in limited quantity—750 copies were printed this year—it is sent to agricultural institutions in some 60 countries overseas, and numerous institutions reciprocate by sending copies of their publications for filing in the Department's libraries.

Of the 13 papers included in the year's issues of the journal, seven were contributed by the Division of Animal Industry, five by the Division of Plant Industry, and one by the Division of Dairying. All Divisions published some papers in more specialized journals.

The second edition of Volume III of the Queensland Agricultural and Pastoral Handbook was in much demand throughout the year. Dealing with insect pests and disease of plants, this publication is offered to Queensland primary producers at the concession price of 10s. a copy. Good progress has been made in the compilation of the second editions of Volume I (Farm Crops and Pastures) and Volume II (Horticulture).

Under the Commonwealth Extension Services Grant a number of special publications have been issued, covering cotton growing, rearing of chickens, and nutritional disorders of plants.

The introduction during the year of an offset printing machine will enable a more flexible programme to be adopted in the preparation and distribution of extension circulars.

The press and radio news services continue to make good use of the Department's weekly News Bulletin, which contains topical information for primary producers. Among newspapers and radio stations there are now 90 recipients of the bulletin. Most of these are within the State. However, there are a few in New South Wales and Victoria that provide a service for Queensland farmers and make use of bulletin material.

The space and time given to bulletin items must inevitably prove of great value to extension, and the co-operation of press and radio in this service is much appreciated.

From time to time the service has supplied newspapers with specially prepared material for agricultural supplements, and a constant flow of news on the operations of the Department has been released for the information of producers and the general public.

Broadcasting.

For many years the A.B.C. Country Hour was the only broadcasting service used to any extent by the Department. More recently, however, scripts have been supplied weekly to two country commercial stations, weekly live talks have been given over two others, and interviews and talks have been recorded by the A.B.C. for its "Breakfast Sessions" from country stations.

It was felt that the Department could make still greater use of broadcasting as an extension medium, and accordingly a tape recorder was purchased from Commonwealth Extension Services Grant funds. The recorder has been supplied on loan to the Branches, and in the six months of its operation, 140 talks have been recorded and distributed to broadcasting stations in the principal farming areas.

It is believed that this extension of broadcasting will have excellent results. Time is provided free by the stations participating, and in most cases programmes are presented when they have most chance of reaching a wide audience.

A special feature of these broadcasts is that district officers are encouraged to participate. Not only will they become better known in their areas as a result, but as extension workers they will be able to operate more effectively.

Library.

There was an increasing call throughout the year upon the services of the Central Library. With the continuing decentralization of the Department's services to the primary producer, there has been a corresponding increase in the number of officers and centres drawing upon the Library. More than 150 different periodicals are received by the Library, and up to 2,000 copies of these may be in circulation at any one time among several hundred officers. In addition, each year thousands of pamphlets are received and issued on loan to officers as required.

Unfortunately one of the most important functions of the library—the compilation of subject-matter information for special purposes—has had to be curtailed on account of shortage of staff.

Photography.

The Photographic Section has been employed extensively in field, laboratory and studio work for various Branches of the Department, and has been called upon to prepare slides and transparencies.

The developing, printing and enlarging of exposed film received from Branches occupied much of the section's time. The quantity of this exposed film was greater than in previous years, and in addition the section had to process field officers' films required for extension and scientific purposes.

A photocopier purchased during the year has greatly simplified the reproduction of diagrams, scientific articles and like material.

Though two or three Branches of the Department have prepared films on agricultural subjects, and several others have compiled their own collections, the Department has at the moment no central film lending library for use by farmer groups. However, officers of several Branches have screened films for farmer audiences, and as the volume of films applicable to Queensland conditions becomes greater, it is hoped to develop their use as an extension medium.

Exhibits.

The Department's court—now one of the largest and most interesting exhibits at the Brisbane Royal National Show—attracted a large attendance in 1954. Prepared under the supervision of the Special Administration Officer, the display brought improved farming practices to the notice of primary producers, and provided many thousands of city people with an insight into the wide field of operations of the Department.

Show exhibits have been staged at various country centres, featuring soil conservation, fodder conservation, weed control, dairy farm efficiency and tropical agriculture, and floats have been prepared for various commemorative processions.

By Authority: A. H. TUCKER, Government Printer, Brisbane.